TMDL FOR MERCURY IN FISH TISSUE FOR COASTAL WATERS OF THE CALCASIEU RIVER BASIN

May 28, 2002

TMDL FOR MERCURY IN FISH TISSUE FOR COASTAL WATERS OF THE CALCASIEU RIVER BASIN

SUBSEGMENT 031201

Prepared for

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EXECUTIVE SUMMARY

The Calcasieu River basin coastal bays and Gulf waters to the State 3-Mile Limit (subsegment 031201) were included on the 1999 Louisiana Modified Court Ordered 303(d) List as being impaired by mercury. The subsegment fishable use was determined to be impaired as a result of a Gulf-wide fish consumption advisory for mercury in king mackerel (*Scomberomorus cavalla*). King mackerel is a top predator fish in the Gulf of Mexico and is a popular sportfish. As a result of the impaired fishable use, a total maximum daily load (TMDL) study of this subsegment was required under the Clean Water Act.

The purpose of this TMDL study is to determine the mercury load that the subsegment can assimilate such that mercury tissue concentrations in king mackerel remain below specified levels (the TMDL), and the reduction of the current mercury load required to reduce king mackerel tissue mercury concentrations to the specified levels. The TMDL is the sum of the wasteload allocation (contributions from point sources), the load allocation (contributions from nonpoint sources), and a margin of safety (MOS). In this study, TMDLs were determined based on two fish tissue mercury concentrations; the Louisiana fish consumption guideline fish tissue concentration of 0.5 mg/kg mercury, and the EPA's fish tissue criteria of 0.3 mg/kg of methylmercury. In order to incorporate a 20% MOS, the target fish tissue concentrations used to determine the TMDLs were set to 0.4 mg/kg and 0.24 mg/kg. There were no point sources (NPDES discharges) with known mercury discharges to the coastal waters, so the TMDLs in this study do not include wasteload allocations. The TMDLs in this study consist of load allocations and MOS. The sources of the load allocation in these TMDLs were atmospheric deposition and the Calcasieu River.

Existing measurements of mercury in king mackerel collected off the Louisiana coast were used to calculate the reduction of the current mercury load required to reduce king mackerel tissue mercury concentrations to the target fish tissue concentrations. The reduction factor was calculated by dividing the average tissue mercury concentrations of king mackerel collected off the Louisiana coast by the target fish tissue mercury concentrations. A linear relationship was assumed between the mercury load to the subsegment and king mackerel tissue mercury

concentrations. Therefore, it was assumed that if the mercury load to the subsegment was reduced a certain percentage, the mercury concentrations in king mackerel tissue would be reduced by the same percentage.

The atmospheric deposition mercury load to the subsegment was estimated using data from the National Atmospheric Deposition Program Mercury Deposition Network station in Lake Charles, LA. The mercury load to the subsegment from the Calcasieu River was estimated using data on NPDES regulated point source discharges of mercury to the Calcasieu River. Since the actual Calcasieu River mercury load was uncertain, a range of potential mercury loads were calculated for the Calcasieu River. The Calcasieu River and local air deposition were the two primary sources of mercury loading to the subsegment.

A 56% reduction in the mercury load to the subsegment was estimated to reduce king mackerel tissue mercury concentrations to 0.4 mg/kg. This reduction resulted in a TMDL of 1,915 g/yr of mercury. A 74% reduction in the mercury load to the subsegment was estimated to reduce king mackerel tissue mercury concentrations to 0.24 mg/kg. This reduction resulted in a TMDL of 1,149 g/yr of mercury. Implementation of existing and proposed regulations for limiting mercury emissions to air will contribute to achieving these reductions.

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1.0 INTRODUCTION

The Calcasieu River Basin Coastal Bays and Gulf Waters to the State 3-Mile Limit (subsegment 031201) were included on the Louisiana Modified Court Ordered 303(d) List as being impaired by mercury. Mercury was identified as a problem due to bioaccumulation in fish tissue, specifically king mackerel (*Scomberomorus cavalla*). There is a Gulf coast wide consumption advisory for king mackerel as a result of mercury concentrations in the fish tissue. Therefore, while there have been no known violations of the numeric mercury water quality standard, subsegment 031201 is considered to not be meeting the narrative water quality standard and designated use of a fishable water body. As a result, development of a TMDL study is required. Louisiana coastal waters are not the only source of mercury exposure for king mackerel. This TMDL study is part of a Gulf-wide effort to reduce mercury exposure of king mackerel and other marine life.

King mackerel are a large predator fish that range throughout the northern Gulf. King mackerel are a popular sport fish in the Gulf of Mexico. Commercial fishermen also harvest them. In the spring they migrate along the northern Gulf coast from the Florida Keys to Texas, returning in late fall.

The purpose of a TMDL is to determine the pollutant loading that a waterbody can assimilate without exceeding the water quality standard for that pollutant and to establish the load reduction that is necessary to meet the standard in a waterbody. The TMDL is the sum of the wasteload allocation (WLA), the load allocation (LA), and a margin of safety (MOS). The WLA is the load allocated to point sources of the pollutant of concern, and the LA is the load allocated to nonpoint sources (NPS). The MOS is a percentage of the TMDL that accounts for the uncertainty associated with the model assumptions, data inadequacies, and future growth.

2.0 DESCRIPTION OF STUDY AREA

Subsegment 031201 (Calcasieu River Basin Coastal Bays and Gulf Waters to the State 3 Mile Limit) is in the Gulf of Mexico and extends from the shoreline to the State 3-Mile Limit (see Figure 2.1). It is located off the coast in Cameron Parish. Subsegment 031201 is bounded on the west by the Sabine River Basin coastal waters (Subsegment 110701), and on the east by the Mermentau River Basin coastal waters (Subsegment 050901). Cameron Parish north of the subsegment is estuarine in nature. Subsegment 031201 is part of an important marine fishery. Commercial fishing, recreational fishing, and oyster production occur in this subsegment.

2.1 Hydrology

Subsegment 031201 receives drainage from the Calcasieu River via Calcasieu Lake and the Calcasieu River ship channel. There is also water exchange between the extensive coastal estuary and the subsegment. Frequently during the summer and fall, water levels in the Gulf of Mexico are higher than water levels in Calcasieu Lake and the ship channel. Under these conditions the subsegment does not receive input from the Calcasieu River Basin.

The subsegment also receives hydrologic inputs from currents in the Gulf of Mexico. Water movement in the Gulf of Mexico is primarily in the westerly direction along the coast of Louisiana.

2.2 Point Sources

A listing of all NPDES permits in Louisiana was searched to identify any permits within subsegment 031201. This listing was prepared by EPA Region 6 using databases and permit files from the Louisiana Department of Environmental Quality (LDEQ). Based on this listing, one NPDES permit was identified for subsegment 031201. This permit does not include a limit for mercury, and there are no data available on mercury concentrations in releases from this type of facility. Therefore, this point source was not included as a mercury source in this TMDL study.

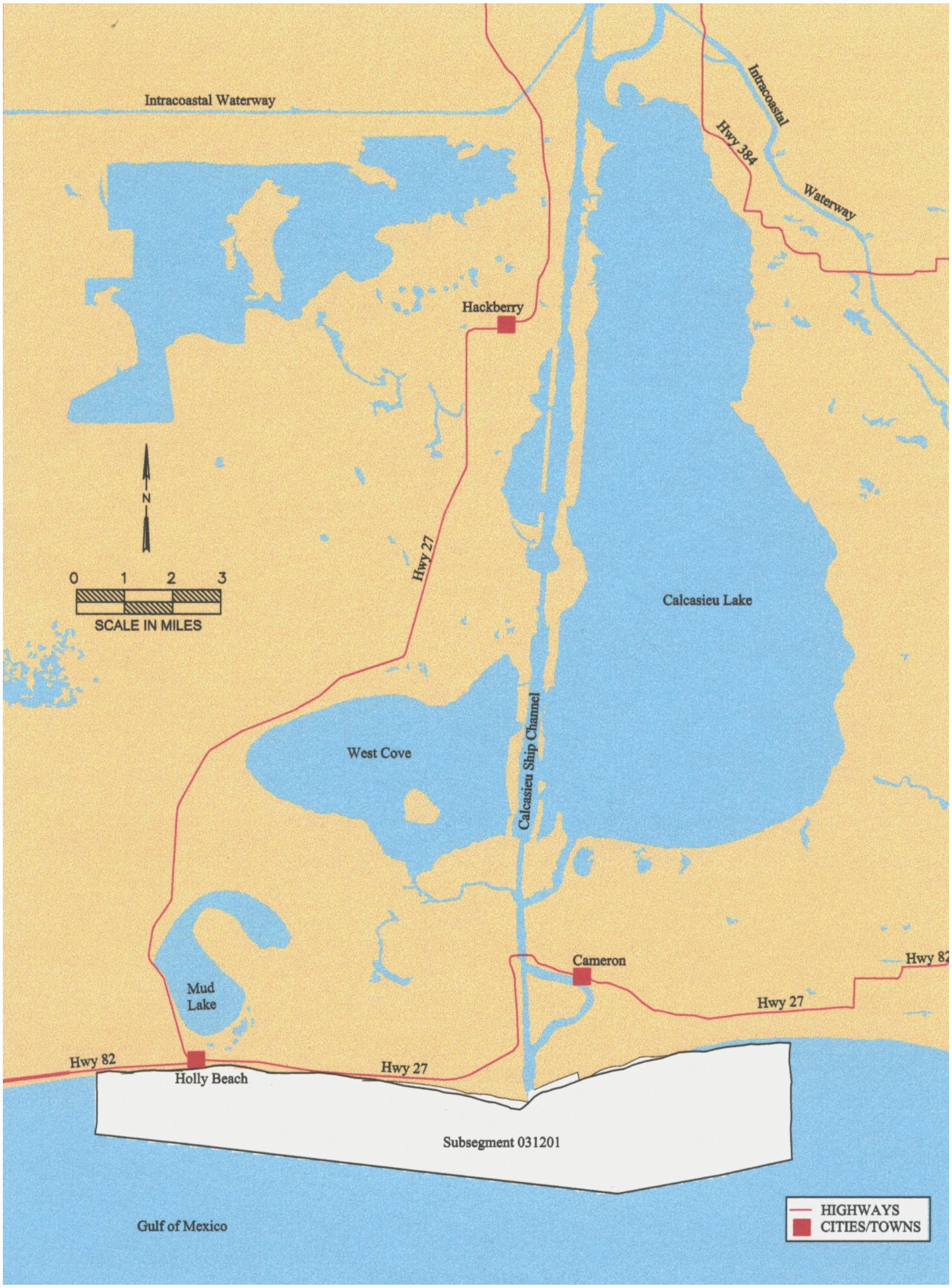

Figure 2.1. Location map for Calcasieu Coastal Waters Mercury TMDL.

3.0 WATER QUALITY STANDARDS AND EXISTING WATER QUALITY CONDITIONS

3.1 Water Quality Standards

The State of Louisiana has developed water quality standards for the state (LDEQ 2000b). The designated uses for the Calcasieu River Basin Coastal Bays and Gulf Waters to the State 3-Mile Line (subsegment 031201) are primary and secondary contact recreation, propagation of fish and wildlife, and oyster propagation. The Louisiana mercury marine water quality standard is 0.025 Fg/L as total recoverable mercury. The narrative standard for toxic substances in Chapter 11 (IX Water Quality Regulations, LDEQ 2000b) is "No substances shall be present in the waters of the state or the sediments underlying said waters in quantities that alone or in combination will be toxic to human, plant, or animal life or significantly increase health risks due to exposure to the substances or consumption of contaminated fish or other aquatic life."

3.2 Existing Water Quality Conditions

Subsegment 031201 was listed on the 1999 Court-Order Modified 303(d) List based on elevated fish tissue mercury concentrations, and is in violation of narrative standards for toxic substances. Measurements of total mercury in water during 1999 in the subsegment at LDEQ station 0852 (Figure 3.1, all figures located at the end of the respective chapters) are all less than 0.05 Fg/L (4 samples). There have been no known violations of the mercury water quality standard. However, a fish consumption advisory for mercury in king mackerel has been issued for the Gulf of Mexico, including the Louisiana coastal waters. Therefore the subsegment "fishable" use is considered to be impaired because there is a human health risk from consuming fish resources, and the subsegment was included on the 303(d) List. Mercury is also being addressed as part of a TMDL project in Calcasieu Estuary (SAIC 2002).

The Louisiana Department of Health and Hospitals (LDHH) issued a fish consumption advisory for king mackerel in Louisiana coastal waters September 1997. This consumption advisory was issued based on king mackerel tissue mercury data collected by Louisiana and other Gulf Coast states. Use of data collected outside the subsegment is appropriate based on the extensive migration patterns of this species. The average concentration of total mercury in king mackerel collected off the Louisiana coast was 0.75 mg/kg (Ache et al. 2000). The LDHH uses 0.5 mg/kg total mercury in fish tissue as a guide for issuing fish consumption advisories (LDEQ 2000b).

The EPA recently promulgated a criterion for methylmercury in fish tissue. The EPA criterion is 0.3 mg/kg of methylmercury in fish tissue (EPA 2001a). The existing mercury concentrations measured in king mackerel are as total mercury. However, studies have shown that approximately 95% of the total mercury measured in fish tissue occurs as methylmercury (Bloom et al. 1991). Measured king mackerel tissue mercury concentrations will be compared with both the EPA methylmercury criterion and LDHH total mercury criterion in this TMDL study.

3.3 Available Fish and Water Quality Data

LDEQ maintains a number of water quality monitoring stations in the Gulf of Mexico and coastal waters (Figure 3.1). Total mercury in water is measured at all of these sites (detection limit 0.05 Fg/L). Mercury in sediment and fish has also been measured at some of these sites as part of LDEQ's ongoing mercury study. LDEQ water quality station 0852 is located in subsegment 031201. Fish mercury data have been collected at this site as well as the routine water quality analyses. These data are included in Appendix A. No king mackerel were collected at station 0852.

Louisiana followed the fish sampling protocols recommended in *Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories,* Vol 1 (EPA 1995). Fish were collected from 1994 through 1999 throughout the Gulf of Mexico and Calcasieu River basin (LDEQ 1999, Arche et al. 2000, LDEQ 2000a). King mackerel mercury concentrations for Louisiana coastal waters are listed in Table 3.1 (all tables are located at the end of the respective chapters) and sampling locations are shown on Figure 3.1.

Table 3.1. LDEQ mercury concentrations in king mackerel (*Scomberomorus cavalla*) collected in the Gulf of Mexico (http://www.deq.state.la.us/surveillance/mercury/mercraw.htm).

Site No.	Site Name	Date	Weight (g)	Length (cm)	Total Mercury (mg/kg)
1133	Gulf of Mexico near EC rig 89, LA	62301	3770.6	89.8	0.734
1029	Gulf of Mexico, West Cameron 181, LA	72600	4876.2	97.8	1.322
1029	Gulf of Mexico, West Cameron 181, LA	72600	4422.1	91.4	0.875
1029	Gulf of Mexico, West Cameron 181, LA	72600	5641.7	99.1	0.915
1029	Gulf of Mexico, West Cameron 181, LA	72600	4762.8	97.8	0.438
1023	Gulf of Mexico near ERC Rig-EC38A, LA	70900	5414.9	97.8	1.018
914	Gulf of Mexico, South of Southwest Pass, LA	91499	6577.2	109.2	0.967
914	Gulf of Mexico, South of Southwest Pass, LA	91499	12133.8	127	2.328
914	Gulf of Mexico, South of Southwest Pass, LA	91499	4422.6	96.5	0.891
914	Gulf of Mexico, South of Southwest Pass, LA	91499	7767.9	114.3	1.389
914	Gulf of Mexico, South of Southwest Pass, LA	91499	14742	132	1.947
914	Gulf of Mexico, South of Southwest Pass, LA	91499	3628.8	91.4	0.648
751	Gulf of Mexico, West Cameron Block 171, LA	71698	6237	100.3	0.535
751	Gulf of Mexico, West Cameron Block 171, LA	71698	4082.4	90.2	0.5
751	Gulf of Mexico, West Cameron Block 171, LA	71698	4337.6	95.9	0.798
751	Gulf of Mexico, West Cameron Block 171, LA	71698	3742.2	91.4	1.183
751	Gulf of Mexico, West Cameron Block 171, LA	71698	7257.6	121.9	1.058
751	Gulf of Mexico, West Cameron Block 171, LA	82001	3033.5	81.9	0.152
751	Gulf of Mexico, West Cameron Block 171, LA	82001	1616	67.3	0.133
751	Gulf of Mexico, West Cameron Block 171, LA	82001	6123.6	102.8	1.055
751	Gulf of Mexico, West Cameron Block 171, LA	82001	4054.1	86.3	0.432
750	Gulf of Mexico, West Cameron Block 110, LA	72000	5074.7	99.7	1.685
750	Gulf of Mexico, West Cameron Block 110, LA	72000	8590.1	116.2	1.678
749	Gulf of Mexico, South Marsh Island Block 6, LA	72498	6123.6	102.9	0.702
749	Gulf of Mexico, South Marsh Island Block 6, LA	72498	2778.3	81.6	0.595
749	Gulf of Mexico, South Marsh Island Block 6, LA	72498	5670	101.6	0.704

Table 3.1. Continued.

Site No.	Site Name	Date	Weight (g)	Length (cm)	Total Mercury (mg/kg)
749	Gulf of Mexico, South Marsh Island Block 6, LA	72498	2721.6	81.9	0.442
749	Gulf of Mexico, South Marsh Island Block 6, LA	72498	3940.7	91.4	0.65
749	Gulf of Mexico, South Marsh Island Block 6, LA	72498	7711.2	109.2	0.953
749	Gulf of Mexico, South Marsh Island Block 6, LA	72498	3260.3	88.3	0.516
643	Gulf of Mexico, ST-128, south of Devils Island, LA	91897	2260	80	0.439
643	Gulf of Mexico, ST-128, south of Devils Island, LA	102997	.	113.7	0.826
634	Gulf of Mexico, Southwest Pass, LA	91897	4082.4	71.7	1.386
569	Gulf of Mexico south of Grand Isle in West Delta Block 143, LA	110696	7682.9	107.2	0.713
568	Gulf of Mexico south-southeast of Grand Isle, LA	120396	.	38.3	0.726
568	Gulf of Mexico south-southeast of Grand Isle, LA	120396	.	36.1	0.33
568	Gulf of Mexico south-southeast of Grand Isle, LA	120396	.	46.9	2.202
568	Gulf of Mexico south-southeast of Grand Isle, LA	120396	.	44.4	1.673
568	Gulf of Mexico south-southeast of Grand Isle, LA	120396	.	32.9	0.417
568	Gulf of Mexico south-southeast of Grand Isle, LA	120396	.	35.9	0.554
567	Gulf of Mexico south-southwest of Grand Isle, LA	102996	5783.4	97.5	0.519

Figure 3.1. LDEQ mercury monitoring stations in the Gulf of Mexico.

4.0 DEVELOPMENT OF THE TMDL

4.1 Definition of a TMDL

The purpose of a total maximum daily load (TMDL) study is to determine the pollutant loading that a waterbody can assimilate while maintaining its prescribed uses (loading capacity), and to establish the load reduction that is necessary to eliminate the waterbody use impairment. The loading capacities of waterbodies vary on a site-specific basis due to (1) sources, inputs, and loads of mercury to the waterbody, (2) environmental conditions within the waterbody that mediate methylation and bioaccumulation, and (3) the food web or food chain through which mercury bioaccumulates (Armstrong et al. 1995). Currently, the waterbody concentrations of mercury and methylmercury are unknown. In the future, clean sampling and analysis procedures during water column monitoring will provide better data for estimates of the loading capacity.

The TMDL is the sum of the WLA, the LA, and MOS. The WLA is the pollutant load allocated to point sources. The LA is the pollutant load allocated to nonpoint sources and background. The MOS is a percentage of the TMDL that accounts for the uncertainty associated with model assumptions, data inadequacies, and future growth.

4.2 Conceptual Framework

Mercury is unlike many other metals because it has a volatile phase at ambient temperatures and can be transported in a gaseous, soluble, or particulate form (Figure 4.1, all figures are located at the end of the chapter). Mercury is emitted to the atmosphere in both elemental gaseous Hg(0) and divalent Hg(II) forms. Anthropogenic direct emissions, natural emissions, and indirect re-emission of previously deposited mercury are major sources of mercury to the atmosphere (Figure 4.1). Gaseous Hg(0) is relatively insoluble and is capable of being transported long distances. However, ozone or other oxidizing agents in the atmosphere can convert Hg(0) to Hg(II). Hg(II) is much more reactive, soluble, and can sorb onto particulates, resulting in both wet and dry mercury deposition within local (i.e., 100 km from the source, EPA 2001b) and regional areas (EPRI 1994). Some Hg(II) can also be chemically reduced to Hg(0). Hg(0) can be transported long distances and contribute to regional and global background concentrations.

Inputs of mercury to coastal areas include rivers, atmospheric deposition, upwelling from the deep ocean, and release from sediments. Inputs to coastal areas from river systems often account for the largest portion of the total load to the area (Cossa et al. 1996). Over 90% of the total mercury from river systems is bound to particles as inorganic mercury species (Cossa et al. 1996). It is assumed that this mercury is deposited and buried as near shore sediments (Cossa et al. 1996). Recent studies indicate that offshore oil well drilling operations may be another significant source of mercury to coastal systems through disposal of used drilling ‘muds’ containing mercury at the drilling sites (The Times-Picayune, January 1, 2002). Additional potential mercury sources in the Calcasieu River basin coastal waters include the extensive estuarine system along the coast, and dredging operations in the Calcasieu ship channel.

Transformation of inorganic mercury to organic or methylmercury makes mercury available for bioaccumulation and biological magnification through the food chain (Figure 4.2). In coastal areas, methylation is believed to occur in sediments and in the water column near the oxycline (Rolfus and Fitzgerald 1995). The resulting methylmercury can be transported to the mixed layer of the water column and incorporated into the lower levels of the marine food web (i.e., plankton, planktivorous fish, piscivorous fish), or incorporated into the benthic sediment community (i.e., mussels, benthic worms). Estuaries also have environments that are very conducive to microorganisms that methylate mercury. Once methylmercury enters the food chain, it binds with protein in muscle tissue of fish and other living organisms (EPA 1997a, EPA 1998).

Methylmercury is lost very slowly from fish tissue, on the order of years (Trudel and Rasmussen 1997). Therefore, as long as methylmercury is in the environment and in prey species, methylmercury concentrations will continue to increase or biomagnify throughout the life of the fish. Older, larger fish typically have higher mercury concentrations than younger, smaller fish, with the highest concentrations found in top predator fish such as king mackerel.

4.3 TMDL Methodology

This TMDL uses king mackerel tissue monitoring data as a means to determine whether the subsegment “fishable” use is being impaired, and the reductions needed to eliminate the impairment. To achieve the “fishable” use, a fish tissue total mercury concentration of 0.5 mg/kg (LDHH fish consumption advisory guidance concentration) or fish tissue methylmercury concentration of 0.3 mg/kg (EPA criterion) should not be exceeded. The target ‘safe’ levels of total mercury for king mackerel in this TMDL are 0.4 mg/kg (based on the LDHH advisory concentration) and 0.24 mg/kg, (based on the EPA criterion). These target levels incorporate a 20% MOS in the analyses for both criterion. In addition to the explicit 20% MOS, there is an implicit MOS as a result of using a tissue methylmercury criterion with tissue total mercury measurements. A two-step approach was used to estimate loading capacity and the reductions required to achieve the “fishable” use in the subsegment. Loadings were estimated from both point and nonpoint sources in the first step, while reductions were estimated based on the target ‘safe’ levels for king mackerel tissue mercury concentration in the second step.

Load reduction estimates were obtained using the average observed king mackerel tissue concentration and calculating the percent decrease in fish tissue concentration needed to result in both of the target ‘safe’ levels of fish tissue mercury concentration. If the total mercury body burden of king mackerel were reduced to <0.4 mg/kg, the subsegment would achieve its “fishable” use. If the total mercury body burden of king mackerel were reduced to <0.24 mg/kg, the fish would meet the EPA methylmercury criterion. Therefore, the mercury reductions required to achieve the target tissue mercury concentrations were based on the required reduction in king mackerel tissue mercury concentrations needed to achieve the target ‘safe’ levels of 0.4 mg/kg and 0.24 mg/kg fish tissue total mercury concentrations. A linear relationship was assumed between reductions in loads to the subsegment and reductions in king mackerel tissue mercury concentrations. This relationship is consistent with steady-state assumptions and the use of bioaccumulation factors. However, interactions of both inorganic and organic mercury with sulfide, organic carbon, and other water quality constituents can affect mercury bioavailability for both methylation and uptake (Armstrong et al. 1995; EPA 1997a, 1998).

In order to establish the reduction needed in king mackerel tissue mercury concentrations, the average body burden was divided by the target ‘safe’ level tissue mercury concentration. The average body burden was the average of reported total mercury tissue concentrations in king mackerel sampled from the Gulf of Mexico off the Louisiana coast. A hazard quotient approach was directly applied to estimate the load reduction (RF), as illustrated in the following equations:

RF = MC/SC, where

- RF = Reduction Factor
- MC = Measured tissue mercury concentration (average concentration reported in Gulf of Mexico king mackerel, mg/kg wet weight)
- SC = Safe tissue mercury concentration (with MOS, mg/kg wet weight)

and,

TMDL = (EL/RF) x SF, where

- TMDL = total maximum daily load
- RF = Reduction Factor
- EL = Existing total load (includes point and nonpoint sources)
- SF = Site specific factor(s) (requires study, but could be based on measured sulfate, organic carbon, alkalinity or pH values that influence mercury methylation and bioaccumulation. Assumed to be 1 in this study).

This approach follows the precedence established in *Mercury TMDLs for Segments Within Mermentau and Vermillion-Teche River Basins* (EPA 2000) and the methodology recommended by the Federal Water Quality Coalition (2001).

4.4 Existing Total Load

Potential mercury sources to the Calcasieu River coastal waters include both nonpoint and point sources. Load from nonpoint sources could include regional atmospheric deposition inputs, local source atmospheric contributions, inputs from the Calcasieu River basin via the Calcasieu River ship channel, Calcasieu Lake, and the Calcasieu estuaries, dredging activities in the Calcasieu ship channel, and inputs from other portions of the Gulf of Mexico due to upwelling and currents. Point source loads of mercury could come from facilities discharging to the subsegment, and disposal of used drilling ‘muds’ at offshore oil rigs in the subsegment.

Not all of the potential sources of mercury load to the Calcasieu River basin coastal waters subsegment were included in the current load estimate for the subsegment. Mercury loading resulting from dredging in the Calcasieu ship channel was not quantified because it redistributes mercury already present in the subsegment; it does not add mercury to the subsegment. Dredged material from outside the subsegment is not disposed of in the subsegment (Steve Patorno, Chief, Dredging, USACE New Orleans District, personal communication 2001). In addition, mercury inputs from the estuarine system along the coast and other portions of the Gulf of Mexico were not quantified. Since mercury would also be transferred from the subsegment to the estuarine system and other portions of the Gulf of Mexico, the net transport of mercury between the subsegment, the estuary, and the Gulf of Mexico was assumed to be zero.

The sample size of measurements of mercury in the environment is small. In addition, estimates of the mercury load to the subsegment have uncertainty associated with them. In order to take this uncertainty into account, a range of load estimates is presented in this TMDL.

4.4.1 Atmospheric Deposition

Data for regional atmospheric deposition were obtained from the National Atmospheric Deposition Program (NADP) website. Data from Monitoring Location LA05, Calcasieu Parish, Louisiana were used to represent atmospheric deposition of mercury in the subsegment (Figure 4.3). Station LA05 had data available for 1989 through 2000 (Appendix B). The average value of the wet deposition for the period of record was 10.6 Fg/m^2/yr. An estimate of the total atmospheric deposition was based on the assumption that dry deposition is about 40% to 60% of wet deposition (EPA 2001b) resulting in a regional atmospheric deposition of 15.9 Fg/m^2/yr (Table 4.1). Wet deposition is the mercury removed from the atmosphere during rain events. Dry deposition is the mercury removed from the atmosphere on dust particles, by sorption to vegetation, gaseous uptake by plants, or other processes during non-rainfall periods (EPA 1997a).

Precipitation data were also available from the NADP website (NADP 2001). These data were compared with precipitation data from two weather stations near the subsegment obtained from Hydrosphere (2000) (Appendix C). The weather stations received more precipitation than the NADP station (Table 4.1). Since wet deposition of mercury is related to precipitation, an area receiving more precipitation could be assumed to receive a greater loading of mercury through wet deposition. Therefore, the mercury deposition for the NADP station was adjusted based on the precipitation data from the NADP site and the weather stations near the subsegment. A ratio of 1.22 was obtained by dividing the average annual precipitation from the weather stations (1.12 m/yr) by the average annual precipitation at station LA05 (0.92 m/yr). Multiplying the regional atmospheric deposition of 15.9 Fg/m^2/yr by the ratio of 1.22 resulted in a precipitation corrected atmospheric deposition of 19.4 Fg/m^2/yr for the subsegment. NADP data and Hydrosphere (2000) data are shown in Table 4.1.

4.4.2 Local and Global/Regional Atmospheric Deposition Sources

The LA05 Deposition Monitoring Station includes both local emission sources and global/regional input. Local atmospheric deposition for the watershed was estimated based on data from the EPA Office of Air Quality Planning and Standards AIR Data Program, National Toxics Inventory (NTI). The NTI is a complete national inventory of stationary and mobile sources that emit hazardous air pollutants (HAPs). Data from the NTI web site were downloaded using the Maximum Attainable Control Technology (MACT) report format. The MACT report includes the number of sources and total 1996 HAP emissions for each MACT source category included in the NTI (Appendix D).

In this TMDL, local sources are defined as sources within the subsegment and within all counties within a distance of 100 km around the subsegment boundary. The area within which these local sources are located is referred to as the “airshed”. The NTI MACT report format has sources listed by county, therefore the airshed boundary is determined by county boundaries and if a portion of a county falls within 100 km of the subsegment, then the entire county is included as part of the airshed. The airshed boundary for the subsegment is shown on Figure 4.4. The airshed contains 21,330 km^2. The mercury emissions for each MACT category found within the airshed and the Hg(II) emissions calculated from the MACT data that contribute to the local atmospheric deposition are shown in Table 4.2. MACT categories not shown in Table 4.2 (e.g., municipal waste incineration) are not present in the airshed and are not considered local mercury sources in this TMDL. MACT categories not included in Table 4.2 are considered global/regional sources of mercury in this TMDL.

LDEQ also maintains an emissions inventory database of toxic air pollutants including mercury, as part of its Toxic Emissions Data Inventory (TEDI) Program. Major sources of toxic air pollutants submit annual emission reports as part of their regulation under Chapter 51 of the Louisiana Administrative Code. These reports are compiled in the TEDI database, which can be accessed through the LDEQ website (www.deq.state.la.us/evaluation/airmon/tedi.htm). Based on the information in the TEDI database, the only parish in the airshed with major sources of mercury emissions is Calcasieu Parish. Total mercury emissions from major sources in Calcasieu Parish were 1,222 lb (554.3 kg) for 1999 and 1,281 lb (581.1 kg) for 1996 (LDEQ 2000b). Total mercury emissions from sources in Calcasieu Parish reported in the NTI database was 1,702 lb (772.0 kg). The NTI 1996 total is greater than the TEDI 1996 total because it includes minor sources of mercury emissions as well as major sources. The NTI data were used to estimate mercury emissions from local sources because it was judged to be a more complete representation of mercury releases in the airshed.

The distance from the emission source, the forms of the mercury in the emissions, other pollutants in the emissions and the atmosphere, and the weather patterns of precipitation are important factors in determining where mercury released to the air will deposit. Divalent mercury [Hg(II)] is the dominant form of mercury in both rainfall and most dry deposition processes. An estimate of the Hg(II) emitted from MACT category sources in the airshed was calculated based on source speciation percentages (EPA 2001b, Russ Bullock personal communication 2001) (see Table 4.2). The mercury deposition rate to the watershed due to local sources was determined by dividing the total Hg(II) emissions of the airshed (362,923 g/yr) by the airshed area (21,330 km^2). The local deposition rate is shown in Table 4.1. The global/regional deposition rate was set equal to the precipitation corrected deposition rate (19.4 Fg/m^2/yr) minus the local source deposition rate (17.0 Fg/m^2/yr). Based on the analysis of the local sources, the portion of the mercury deposition that can be attributed to local sources versus global/regional sources is shown in Table 4.1. We assumed that facility emissions would not vary much from these levels, so no variation in the atmospheric load was included in the total atmospheric mercury load to the subsegment.

4.4.3 Point Sources

As described in Section 2.2, there was only one NPDES permitted source discharging to subsegment 031201. This point source, an oil and gas operation, did not have mercury limits in its permit. There is no data available indicating mercury concentrations that would be expected in releases from this type of facility. Therefore, mercury contributions from this point source were assumed to be zero.

A group of recent studies have addressed the potential for effects of mercury from oil drilling operations in the Gulf of Mexico on fish mercury levels (The Times-Picayune January 1, 2002). There are between 50 and 60 wells located in the subsegment (Louisiana Department of Natural Resources website, SONRIS-GIS oil and gas database). Spent drilling ‘muds’ from these wells could be contributing mercury to the food chain (The Times-Picayune January 1, 2002) despite the fact that few, if any, of these wells are in active production. There are no active leases in the subsegment, so it is unlikely that new wells are being drilled. An estimate of mercury load from spent drilling ‘muds’ was not included in the current mercury load estimate because no data on the mercury characteristics of these drilling ‘muds’ is currently available.

4.4.4 Calcasieu River Ship Channel

Mercury contributions from the Calcasieu River via the ship channel were also estimated. EPA has determined that in coastal areas, mercury inputs from rivers can be significant (Cossa et al. 1996). Therefore, mercury inputs to the subsegment from the Calcasieu River were included in the estimate of subsegment loading.

An estimate of the mercury load to the subsegment from the Calcasieu River was calculated based on point source discharger information. LDEQ does measure total mercury in the Calcasieu River and its tributaries. Most of the surface water mercury concentrations measured by LDEQ in the Calcasieu River basin are less than the 0.05 Fg/L detection level. This detection level is 4 times greater than the fresh water total mercury standard for the State of Louisiana (0.012 Fg/L). Using the detection level, or even the mercury standard to estimate the mercury load from the Calcasieu River resulted in very large loads (63,210 to 263,377 g/year) relative to the atmospheric deposition load (1,424 g/yr). There are over 80 NPDES point source dischargers in the Calcasieu River basin (see Appendix E for listing). We assumed that the majority of the mercury in the Calcasieu River would come from point sources, rather than from nonpoint or background sources. Therefore, the mercury load for the Calcasieu River was estimated using information from the NPDES point source discharges in the Calcasieu River basin.

Data for the NPDES point source dischargers in the Calcasieu River basin (Appendix E) were taken from a list compiled by EPA Region 6 for Louisiana. This list was based on information provided by LDEQ. This list did not include information about mercury limits. A query of EPA's on-line permit compliance system (PCS) revealed three dischargers in the Calcasieu River basin with total mercury limits in their NPDES permits. The Calcasieu River mercury load was estimated using data for these discharges.

Available total mercury concentrations and flow data from the discharge monitoring reports (DMRs) for the three NPDES mercury discharges were retrieved from PCS for the years 1999 and 2000. The DMRs for one of the discharges showed zero mercury discharges for 1999 and 2000 so data from that discharge was not included in the mercury load estimate. The available mercury concentration and flow data for the other two discharges are shown in Appendix F.

Flow data available for the two NPDES mercury discharges were inconsistent. DMR flow data were available from PCS for only one of these discharges, and design flow information was not available for this discharge. For the other discharge, the design flow was known, but there were no DMR flow data. Therefore, the design flow was used to calculate the mercury load from the one discharge for which the design flow was known. For the other discharge, the maximum flow reported on the DMRs (1999-2000) was assumed to be a reasonable approximation of the design flow, and was used to calculate the mercury load.

To account for the uncertainty of estimating the Calcasieu River mercury load with limited data, three estimates of the mercury load were calculated. The upper boundary mercury load was calculated using the maximum mercury concentration reported on the discharge DMRs during 1999-2000. The lower boundary mercury load was calculated using the minimum mercury concentrations reported on the discharge DMRs during 1999-2000. A mid-range mercury load was calculated using the average mercury concentrations reported on the discharge DMRs during 1999-2000. Calculations of the range of Calcasieu River mercury loads are shown in Appendix F. The estimated Calcasieu River mercury loads range from 7,806 g/yr to 800 g/yr. Assuming an average flow rate of 167 m^3/s for the Calcasieu River (Meshele unpublished, Appendix G) these estimated mercury loads would correspond to mercury concentrations of 0.0015 Fg/L to 0.0002 Fg/L in the Calcasieu River.

4.4.5 Current Mercury Load Summary

Table 4.3 summarizes the estimates of the current total mercury loading to subsegment 031201. The entire mercury load to the subsegment is from nonpoint sources. No point source contributions are included in this TMDL study although point source mercury discharge information was used to estimate the mercury load for the Calcasieu River, these point sources are not included as WLAs in the TMDL, since they do not discharge directly to the subsegment. With the information available, it is uncertain wether atmospheric deposition or the Calcasieu River contribute the majority of the mercury load to the subsegment.

4.5 Reduction Factor

As described in Section 4.2 the reduction factor was estimated by dividing the maximum tissue mercury concentration for king mackerel in the Gulf of Mexico off the coast of Louisiana by the target ‘safe’ level tissue mercury concentration. The average reported total mercury tissue concentration for king mackerel in the Gulf of Mexico off the coast of Louisiana is 0.90 mg/kg total mercury (Table 3.1). Dividing this concentration by the 0.4 mg/kg target ‘safe’ total mercury tissue concentration yields a reduction factor of 2.25. Dividing the average king mackerel total mercury tissue concentration by the EPA methylmercury fish tissue criterion of 0.24 mg/kg yields a reduction factor of 3.75. As mentioned previously, in this TMDL study a linear relationship is assumed between changes in king mackerel total mercury tissue concentrations and the mercury load to the subsegment. This means it is assumed that reducing loads to the subsegment by a factor of 2.25 would result in king mackerel total mercury tissue concentrations being reduced to 0.4 mg/kg, and reducing the subsegment mercury load by a factor of 3.75 would result in king mackerel total mercury tissue concentrations being reduced to 0.24 mg/kg.

4.6 Load Allocation

4.6.1 TMDL

Two TMDLs were estimated for this study. One TMDL is based on a target fish tissue total mercury concentration of 0.4 mg/kg (LHHD fish consumption advisory guidance). The other TMDL is based on a target fish tissue total mercury concentration of 0.24 mg/kg (EPA fish tissue methylmercury criterion). The target mercury loads to reduce fish tissue total mercury concentrations calculated from the existing mercury loads to subsegment 031201 are shown in Table 4.3.

4.6.2 Load Allocation

The allocations of the total mercury TMDLs are summarized in Tables 4.4 and 4.5. Annual mercury loads are used in the allocations because long term accumulation of mercury is the concern in this TMDL study, rather than short-term acute toxicity events. The mercury load to the subsegment would need to be reduced 56% to reduce total mercury tissue concentrations in king mackerel to 0.4 mg/kg. A 74% reduction in the mercury load to the subsegment would be required to reduce total mercury tissue concentrations in king mackerel to 0.24 mg/kg.

The total mercury load allocations were determined by reducing the loading rates for the Calcasieu River, local sources of atmospheric deposition, and regional/global sources of atmospheric deposition until the total subsegment mercury load was less than the target subsegment mercury load (from Table 4.3). The same percent reduction was applied to all three of the sources (Calcasieu River, local sources of atmospheric deposition, and global/regional sources of atmospheric depostion). The total maximum loads and margins of safety were calculated from the target subsegment loads calculated in Table 4.3. Since the explicit margin of safety for this TMDL study was 20% (see Section 4.3), the target subsegment loads would be 80% of the total maximum load. Therefore the total maximum loads were calculated as the target subsegment loads divided by 0.8. The margins of safety were calculated as 0.2 times the total maximum loads.

Existing regulations limiting mercury emissions based on MACT guidelines are expected to reduce atmospheric mercury. Table 4.6 shows reductions that would be expected in the local mercury emission sources of this TMDL study as a result of implementing the existing MACT regulations. Overall, about a 20% reduction in local mercury emissions would be expected as a result of implementing the current MACT regulations. Nationally, about a 50% reduction is expected in mercury emissions as a result of implementing MACT regulations. This includes reductions in mercury emissions from source categories, such as municipal waste combustion, that do not occur in the subsegment airshed. Therefore, a 50% reduction in the global/regional source atmospheric load to the subsegment could be expected.

Tables 4.7 and 4.8 show the mercury load allocations taking into account reductions in the atmospheric mercury load as a result of implementation of MACT regulations. In these tables the local atmospheric deposition load has been set to 80% of the current local atmospheric deposition load (shown in Table 4.3) to reflect the expected 20% reduction. The global/regional atmospheric deposition load in Tables 4.7 and 4.8 has been set to 50% of the current global/regional atmospheric deposition load (shown in Table 4.3) to reflect the expected 50% reduction. These tables also show the percent reductions of the Calcasieu River mercury load required to meet the target loads for reducing fish tissue mercury (Table 4.3). The percent reductions of the Calcasieu River mercury load were determined by leaving the atmospheric loads constant and reducing the Calcasieu River load until the total subsegment load was less than the target subsegment load. In half of the load allocations the MACT level atmospheric mercury loads themselves were greater than the target subsegment loads. Therefore, the target subsegment mercury load cannot be met without further reductions in the atmospheric mercury load. Mercury emission limits for additional source categories are either proposed or planned (EPA 2002a). A number of these source categories are local sources of atmospheric mercury load to subsegment 031201 (see table 4.9). Therefore, further reductions would be expected in both local and global/regional atmospheric mercury loads to the subsegment.

4.6.3 Reserve Mercury Load

The conservative estimates used throughout these analyses, including conservative reduction factors, should provide reserve mercury loading to the subsegment. However, previously deposited mercury may sustain high fish tissue concentrations even if all other mercury sources were eliminated.

Table 4.1. Estimate of atmospheric mercury deposition.

NADP Data Summary			**Precipitation Data (1999-2000)**		**NADP Data Summary**		
Station	**Year**	**Rain Gauge (meters/yr)**	**Station**	**Avg Precip (meters/yr)**	**Station**	**Year**	**Wet Hg Deposition (Fg/m^2/yr)**
LA05	1999	0.98	Hackberry, LA	1.22	LA05	1999	12.4
LA05	2000	0.86	Rockefeller WLR, LA	1.03	LA05	2000	8.8
	Average	0.92	Average	1.12		Average	10.6

Dry + Wet = Average wet x 1.5 =	15.9	Fg/m^2/yr
Atmospheric Deposition Correction Factor =	1.22	
Precipitation Corrected Atmospheric Deposition Rate =	19.4	Fg/m^2/yr
Subsegment Area =	73,277,390	m^2
Total Atmospheric Deposition to Subsegment =	1,424	g/yr
Local Deposition Rate =	17.0	Fg/m^2/yr
Global/Regional Deposition Rate =	2.40	Fg/m^2/yr

Table 4.2. Total mercury and Hg(II) emissions within the airshed.

MACT Category	Number of Point Sources*	Total Emissions (lbs/year)	Total Emissions (kg/year)	Hg(II) Speciation Percentage	Hg(II) (g/yr)
0105 - Stationary Reciprocal Internal Combustion Engines	0	0.37	0.17	30%+	50
0107 - Industrial/Commercial/ Institutional Boilers & Process Heaters	7	10.77	4.88	30%	1,465
0410 - Portland Cement Manufacturing	1	0.14	0.064	10%	6.4
0502 - Petroleum Refineries - Catalytic Cracking, Catalytic Reforming, & Sulfur Plant Units	4	327.00	148.32	30%	44,497
0801 - Hazardous Waste Incineration	2	311.28	141.19	20%	28,239
0802 - Municipal Landfills	0	0.38	0.17	0%	-
1403 - Chlorine Production	1	1,280.00	580.60	30% +	174,179
1626 - Pulp & Paper Production	3	85.00	38.56	30%	11,567
1640 - Miscellaneous Organic Chemical Processes	0	0.04	0.017	30%+	5.1
1801 - Medical Waste Incinerators	0	191.60	86.91	60%+	52,145
1803 - Utility Boilers: Coal	1	370.00	167.83	30%	50,349
1805 - Utility Boilers: Oil	1	0.28	0.13	30%	39
1807-2 - Other Solid Waste Incineration - Crematories	0	4.21	1.91	20%	382
Total		2,581.00	1,171.00		362,923

* No estimate available for number of nonpoint sources.

+ No speciation values available in literature, these values are based on speciation values for similar categories and scientific judgement

Table 4.3. Total current mercury load to Louisiana subsegment 031201.

Source Type	Upper Boundary			Most Likely			Lower Boundary		
	Loading Rate		Percent of Total Load	Loading Rate		Percent of Total Load	Loading Rate		Percent of Total Load
	(g/yr)	(g/d)		(g/yr)	(g/d)		(g/yr)	(g/d)	
Calcasieu River	7,806	21.39	84.6%	2,023	5.54	58.7%	800.0	2.19	36.0%
Local Source Atmospheric Deposition	1,247	3.42	13.5%	1,247	3.42	36.2%	1,247	3.42	56.1%
Regional/Global Atmospheric Deposition	177	0.48	1.9%	177	0.48	5.1%	177	0.48	7.9%
Total Subsegment Load	9,229	25.3	100%	3,446	9.4	100%	2,223	6.1	100%
Reduction Factor for 0.40 mg/kg fish Hg	2.25	2.25		2.25	2.25		2.25	2.25	
Target subsegment load to meet 0.4 mg/kg fish Hg	4,102	11.24		1,532	4.20		988	2.71	
Reduction Factor for 0.24 mg/kg fish Hg	3.75	3.75		3.75	3.75		3.75	3.75	
Target subsegment load to meet 0.24 mg/kg fish Hg	2,461	6.74		919	2.52		593	3.75	

Table 4.4. Allocation of mercury load to subsegment 031201 to reduce fish tissue mercury to 0.4 mg/kg.

Source Type	**Upper Boundary**		**Most Likely**		**Lower Boundary**	
	Loading Rate (g/yr)	**Percent of Total Load**	**Loading Rate (g/yr)**	**Percent of Total Load**	**Loading Rate (g/yr)**	**Percent of Total Load**
Calcasieu River	3,512	68.5%	890	46.5%	352	28.5%
Local Source Atmospheric Deposition	561	10.9%	549	28.7%	549	44.4%
Regional/Global Atmospheric Deposition	80	10.9%	78	28.7%	78	44.4%
Total Subsegment Load	4,074	79%	1,516	79.2%	978	79.2%
Percent Reduction of Subsegment Load	55%		56%		56%	
Margin of Safety	1,025	20.0%	383	20.0%	247	20.0%
Total Maximum Load	5,127	100.0%	1,915	100.0%	1,235	100.0%

Table 4.5. Allocation of mercury load to subsegment 031201 to meet 0.24 mg/kg mercury in fish tissue target.

Source Type	Upper Boundary		Most Likely		Lower Boundary	
	Loading Rate (g/yr)	Percent of Total Load	Loading Rate (g/yr)	Percent of Total Load	Loading Rate (g/yr)	Percent of Total Load
Calcasieu River Channel	2,107	68.5%	526	45.8%	208	28.1%
Local Source Atmospheric Deposition	337	10.9%	324	28.2%	324	43.7%
Regional/Global Atmospheric Deposition	48	1.6%	46	4.0%	46	6.2%
Total Subsegment Load	2,444	79.4%	896	78.0%	578	78.0%
Percent Reduction of Subsegment Load	73%		74%		74%	
Margin of Safety	615	20.0%	230	20.0%	148	20.0%
Total Maximum Load	3,076	100.0%	1,149	100.0%	741	100.0%

Table 4.6. Expected reduction in local atmospheric mercury load to subsegment 031201 with implementation of MACT regulations.

MACT Category	Current Hg (II) (g/yr)	Reduction Expected with Regulation	Reduced Hg (II) Load (g/yr)	Citation for Reduction
0105 - Stationary Reciprocal Internal Combustion Engines	50	N/A	50	
0107 - Industrial/Commercial/Institutional Boiler & Process Heaters	1,465	N/A	1,465	
0410 - Portland Cement Manufacturing	6.4	24%	4.9	Federal Register Vol. 64 No. 113
0502 - Petroleum Refineries - Catalytic Cracking, Catalytic Reforming, & Sulfur Plant Units	44,497	N/A	44,497	
0801 - Hazardous Waste Incineration	28, 239	55%	12,707	EPA Hazardous Waste Combustion Website
0802 - Municipal Landfills		N/A	0	
1403 - Chlorine Production	174,179	N/A	174,179	
1626 - Pulp & Paper Production	11,567	59%	4,742	Federal Register Vol. 63 No. 72
1640 - Miscellaneous Organic Chemical Processes	5.1	N/A	5.1	
1801 - Medical Waste Incinerators	52,145	94%	3,129	EPA Fact Sheet 8-15-97
1803 - Utility Boilers: Coal	50,349	N/A	50,349	
1805 - Utility Boilers: Oil	39	N/A	39	
1807-2 - Other Soild Waste Incineration-Crematories	382	N/A	382	
Total	362,923	20%	291,549	

Table 4.7. Allocation of subsegment 031201 mercury load reduction to achieve 0.4 mg/kg fish tissue mercury assuming reduced atmospheric mercury loads due to MACT regulations.

	Upper Boundary		Most Likely		Lower Boundary	
Source Type	**Loading Rate (g/yr)**	**Percent of Total Load**	**Loading Rate (g/yr)**	**Percent of Total Load**	**Loading Rate (g/yr)**	**Percent of Total Load**
Calcasieu River	3,044	59.4%	445	23.2%	0	0.0%
Local Source Atmospheric Deposition	997	19.5%	997	52.1%	997	80.8%
Regional/Global Source Atmospheric Deposition	88	19.5%	88	52.1%	88	80.8%
Total Subsegment Load	4,042	78.8%	1,531	80.0%	1,086	87.9%
Percent Reduction of Calcasieu River Load	61%		78%		100%	
Margin of Safety	1,025	20.0%	383	20.0%	247	20.0%
Total Maximum Load (0.4 mg/kg fish Hg)	5,127	100.0%	1,915	100.0%	1,235	100.0%

Table 4.8. Allocation of subsegment 031201 mercury load reduction to achieve 0.24 mg/kg fish tissue mercury assuming reduced atmospheric mercury loads due to MACT regulation.

Source Type	**Upper Boundary**		**Most Likely**		**Lower Boundary**	
	Loading Rate (g/yr)	**Percent of Total Load**	**Loading Rate (g/yr)**	**Percent of Total Load**	**Loading Rate (g/yr)**	**Percent of Total Load**
Calcasieu River	1,405	45.7%	0	0.0%	0	0.0%
Local Source Atmospheric Deposition	997	32.4%	997	86.8%	997	134.6%
Regional/Global Source Atmospheric Deposition	88	2.9%	88	7.7%	88	11.9%
Total Subsegment Load	2,402	78.1%	1,086	94.5%	1,086	146.5%
Percent Reduction of Calcasieu River Load	82%		100%		100%	
Margin of Safety	615	20.0%	230	20.0%	148	20.0%
Total Maximum Load (0.4 mg/kg fish Hg)	3,076	100.0%	1,149	100.0%	741	100.0%

Table 4.9. Status of MACT regulations for categories of sources of local atmospheric mercury loading to subsegment 031201.

Subsegment 031201 Local Source	**Status of MACT Regulations***
0105 - Stationary Reciprocal Internal Combustion Engines	Planned
0107 - Industrial/Commerical/Institutional Boilers & Process Heaters	Planned
0410 - Portland Cement Manufacturing	Existing
0502 - Petroleum Refineries - Catalytic Cracking, Catalytic Reforming, & Sulfur Plant Units	Proposed
0801 - Hazardous Waste Incineration	Existing
0802 - Municipal Landfills	Proposed
1403 - Chlorine Production	Planned
1626 - Pulp & Paper Production	Existing
1640 - Miscellaneous Organic Chemical Processes	Unknown
1801 - Medical Waste Incinerators	Existing
1803 - Utility Boilers: Coal	Unknown
1805 - Utility Boilers: Oil	Unknown
1807-2 - Other Solid Waste Incineration-Crematories	Uknown

* from http://www.epa.gov/ttn/atw/eparules.htm/

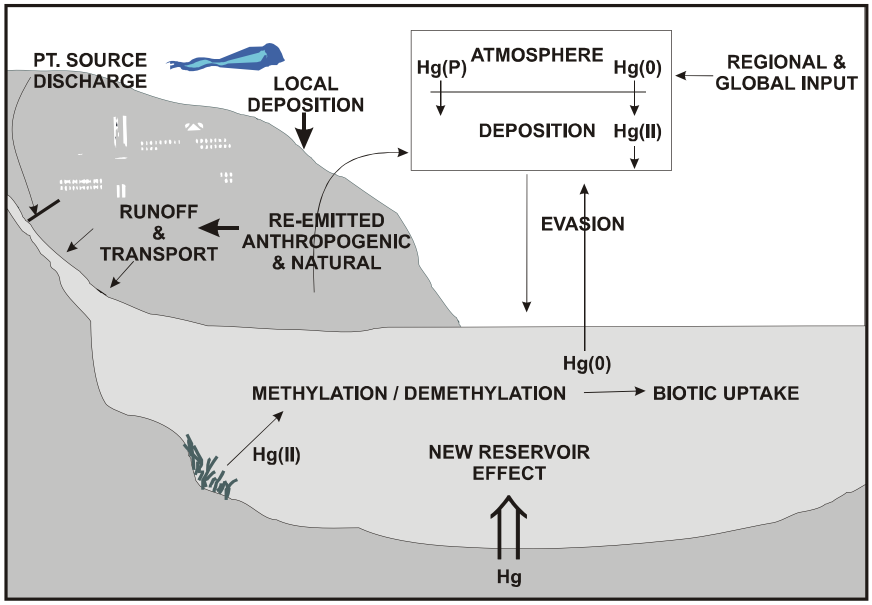

Figure 4.1. General mercury cycle showing atmospheric transport and deposition, point, nonpoint source and natural background contributions, and the effects of new reservoirs on mercury release into the environment (after Mason et al. 1994).

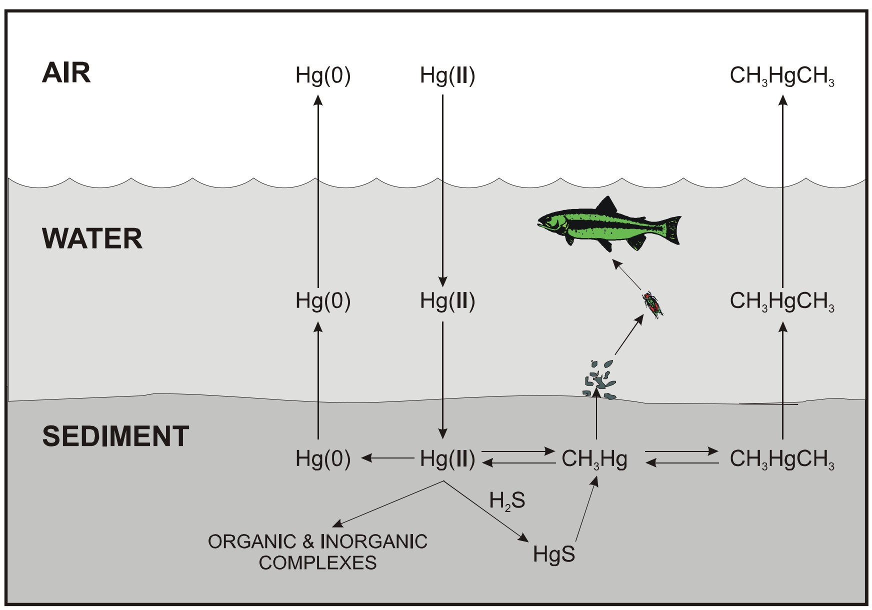

Figure 4.2. Pathways for mercury species through the aquatic ecosystem, including methylation and demethylation, evasion or loss from the water to the atmosphere, and sedimentation and burial in the sediment (after Winfrey and Rudd 1990).

Figure 4.3. Location of NADP monitoring location LA05.

Figure 4.4. Airshed for subsegment 031201.

5.0 MARGIN OF SAFETY, SEASONAL VARIATIONS, AND CRITICAL CONDITIONS

5.1 Margin of Safety

An MOS accounts for any lack of knowledge or uncertainty concerning the relationship between LAs and water quality. In this case, it accounts for uncertainty and variability related to fish tissue mercury concentrations, estimates of mercury loading, and application of the principal of linearity. Although the proposed approach has not been proven, and monitoring and sampling information are not available, it is assumed that a reduction in loading will result in reductions in fish tissue body burden. These TMDLs incorporate an explicit MOS factored into the target 'safe' tissue concentrations. Use of the 'safe' target level of 0.4 mg/kg for the 0.5 mg/kg fish consumption advisory guidance concentration and 0.24 mg/kg for the 0.3 mg/kg EPA methylmercury criterion results in an explicit MOS of 20%. An implicit MOS also results from the method used to estimate total mercury in water for the Calcasieu River. It is unlikely that all mercury discharged to the Calcasieu River makes it to the Gulf of Mexico. Some is probably lost to volatilization (Bob Kelly, SAIC, personal communication 2002).

5.2 Seasonal Variations and Critical Conditions

Wet deposition is greatest in the winter and spring seasons. Mercury loads fluctuate based on the amount and distribution of rainfall, and variability of localized and regional/global sources. While an average daily load is established here, the average annual load is of greatest significance because mercury bioaccumulates over the life of the fish and the resulting risk to human health from fish consumption is a long-term phenomenon. Thus, daily or weekly inputs are less meaningful than total annual loads over many years. The use of annual loads allows for integration of short-term and seasonal variability. Inputs should continue to be estimated through wet deposition and additional monitoring.

Mercury methylation is expected to be highest during the summer. High temperatures promote biological activity. This is also the period when large areas of the Gulf of Mexico west of the Mississippi river experience hypoxia (low oxygen conditions) (Rabalais et al. 1997), which is condusive to methylation. Based on the enhanced methylation and higher predator feeding rates during this period, mercury bioaccumulation is expected to be greatest during the summer. However, given the long depuration times for fish and relatively mild winters in coastal Louisiana, seasonal changes in fish tissue mercury body burden are expected to be relatively small. Inherent variability of mercury concentrations between individual fish of the same and/or different size categories is expected to be greater than seasonal variability.

6.0 REASONABLE ASSURANCE: ONGOING AND FUTURE REDUCTIONS IN EMISSIONS

Reasonable assurance is needed that water quality standards will be attained. Mechanisms to assess and control mercury loads, including strategies and regulatory controls, which would be national in scope, will aid implementation of TMDLs for specific basins. In addition, this TMDL will be reassessed periodically and may be modified to take into account available data and information, and the state of the science.

As rules and standards pursuant to the Clean Air Act have been developed, proposed, and promulgated since 1990, compliance by emitting sources as well as actions taken voluntarily have already begun to reduce emissions of mercury to the air across the US. EPA expects that a combination of ongoing activities will continue to reduce mercury emissions to the air over the next decade. EPA currently regulates emissions of mercury and other HAPs under the MACT program of Section 112 of the Clean Air Act, and under a corresponding new source performance standard (NSPS) program under Sections 111 and 129 of the Act. Section 112 authorizes EPA to address categories of major sources of HAPs, including mercury, by issuing emissions standards that, for new sources, are at least as stringent as the emissions control achieved by the best performing similar source in the category, and, for existing sources, are at least as stringent as the average of the best performing top 12% (or 5 facilities, whichever is greater) of similar sources. EPA may also apply these standards to smaller area sources, or choose to apply less stringent standards based on generally available control technologies (GACT). Sections 111 and 129 direct EPA to establish MACT-equivalent standards for each category of new and existing solid waste incineration units, regulating several specified air pollutants, including mercury. In addition, in 1996 the US eliminated the use of mercury in most batteries under the Mercury Containing and Rechargeable Battery Management Act. This action is reducing the mercury content of the waste stream which is further reducing mercury emissions from waste combustion. Voluntary measures to reduce use of mercury containing products, such as the voluntary measures committed to by the American Hospital Association, also will contribute to reduced emissions from waste combustion.

Based on the EPA's NTI, the highest emitters of mercury to the air include coal-burning electric utilities, municipal waste combustors, medical waste incinerators (MWIs), chlor-alkali plants, and hazardous waste combustors (HWCs). EPA has issued a number of regulations under Sections 111, 112, and 129 to reduce mercury pollution from several of these source categories. Relevant regulations that EPA has established to date under the Clean Air Act include, among others, those listed below.

- The source category of municipal waste combustion (MWC) emitted about 20% of total national mercury emissions into the air in 1990. EPA issued final regulations under Sections 111 and 129 for large MWCs on October 31, 1995. Large combustors or incinerators must comply with the rule by December 2000. These regulations reduce mercury emissions from these facilities by about 90% from 1990 emission levels.

- MWIs emitted about 24% of total national mercury emissions into the air in 1990. EPA issued emission standards under Sections 111 and 129 for MWIs on August 15, 1997. When fully implemented, in 2002, EPA's final rule will reduce mercury emissions from MWIs by about 94% from 1990 emission levels.

- HWCs emitted about 2.5% of total national mercury emissions in 1990. In February 1999, EPA issued emission standards under Section 112 for these facilities, which include incinerators, cement kilns, and light weight aggregate kilns that burn hazardous waste. When fully implemented, these standards will reduce mercury emissions from HWCs by more than 50% from 1990 emission levels.

These promulgated regulations, when fully implemented and considered together with the actions discussed above that will reduce the mercury content of waste, are expected to reduce national mercury emissions caused by human activities by about 50% from 1990 levels.

In February 2002 President Bush announced the Clear Skies Initiative. This initiative proposed to reduce mercury emissions from power plants (electric utilities) by 69%. An intermediate cap of 26 tons of mercury per year was proposed for 2010. Current mercury emissions from power plants are 48 tons per year.

EPA expects to propose a regulation under Section 112 that will limit mercury emissions from chlor-alkali plants, chlorine production facilities which use the mercury cell technology. In addition, under the Integrated Urban Air Toxics Strategy, which was published in 1999, EPA is developing emissions standards under Section 112 for categories of smaller sources of air toxics, including mercury, that pose the greatest risk to human health in urban areas. These standards are expected to be issued by 2004.

It is possible that the cumulative effect of additional standards and voluntary actions will reduce mercury emissions from human activities in the US by more than 50% from 1990 levels. However, whether the overall, total percent reduction in national mercury emissions in the future will exceed 50% cannot be estimated at this time. EPA will continue to track emissions of mercury and evaluate additional approaches to reduce releases of mercury into the environment.

It is expected to take time for mercury concentrations in predatory fish to approach an equilibrium concentration with reduced ambient mercury levels. In the meantime, attention should be placed on management of the fisheries and education about the potential effects of mercury, because mercury concentrations may not be reduced below fish consumption advisory Action Levels anytime in the near future. The feasibility of achieving these reductions was estimated by comparing the anthropogenic point source emission and discharge contributions to the total estimated loading to determine if the designated use could be achieved through reductions in these anthropogenic sources.

The effectiveness of these mercury reduction programs will be evaluated by monitoring the wet deposition rates at the LA05 site and monitoring fish tissue mercury concentrations.

7.0 PUBLIC PARTICIPATION

When EPA establishes a TMDL, 40 CFR §130.7(d)(2) requires EPA to issue a public notice and seek comment concerning the TMDL. This TMDL was prepared under contract to EPA. After completion of a draft TMDL, EPA prepared a notice seeking comments, information, and data from the general and affected public. Comments, data, and information submitted during the public comment period are included in Appendix H (responses to comments are shown in italics). This final TMDL was revised considering public comment, information, and data, and will be transmitted by EPA to the Louisiana Department of Environmental Quality for incorporation into the LDEQ current water quality management plans.

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APPENDIX A

Mercury Data at LDEQ Station 0852

Mercury in fish collected at LDEQ station 0852

From http://www.deq.state.la.us/surveillance/mercury/mercasci.txt

Date	Fish Type	No. of Fish	Weight, g	Length, cm	Total Mercury, mg/kg
8/23/98	RED DRUM	1	1,162.4	47.0	0.068
8/23/98	SPOTTED SEATROUT	8	372.1	34.6	0.078
8/23/98	SPOTTED SEATROUT	8	588.3	38.4	0.100
8/23/98	SPOTTED SEATROUT	3	652.1	41.4	0.120
8/23/98	SPOTTED SEATROUT	4	737.1	43.5	0.102
8/23/98	SPOTTED SEATROUT	4	1,027.7	48.8	0.140

APPENDIX B

Mercury and Precipitation Data from MDN/NADP Site LA05

National Atmospheric Deposition Program/MDN

Site ID:LA05 Report Date: 11/19/01 3:26:04 PM

Site	Date On	Date Off	Subppt	Pptrec	HgConc	HgDep	QR	SampleType	Notes
LA05	10/9/98	10/13/98	0	0	--	0	B	D	sm
LA05	10/13/98	10/20/98	18	18	6.7	120.7	A	W	
LA05	10/20/98	10/27/98	0	0	--	0	B	D	m
LA05	10/27/98	11/4/98	13	13	12.3	159.4	B	W	m
LA05	11/4/98	11/11/98	4.1	4.1	8.9	36	A	W	
LA05	11/10/98	11/17/98	27.4	--	10.3	281.8	B	W	m
LA05	11/17/98	11/24/98	0	0	--	0	B	D	m
LA05	11/24/98	12/1/98	0	0	--	0	B	D	m
LA05	12/1/98	12/8/98	10.2	10.2	9.4	96	B	W	m
LA05	12/8/98	12/15/98	50	50	7.5	374.2	A	W	
LA05	12/15/98	12/22/98	0.3	--	24.7	8.4	B	T	mi
LA05	12/22/98	12/29/98	39	--	3.6	142.1	B	W	m
LA05	12/29/98	1/5/99	46.7	46.7	7.8	365.3	B	W	m
LA05	1/5/99	1/12/99	86.6	86.6	3.7	324	B	W	m
LA05	1/12/99	1/19/99	9.1	--	8	72.6	B	W	m
LA05	1/19/99	1/26/99	4.1	4.1	17	69.2	B	W	hm
LA05	1/26/99	2/2/99	12.7	12.7	--	--	C	W	fhdm
LA05	2/2/99	2/9/99	0.2	--	21	5.1	B	T	im
LA05	2/9/99	2/17/99	26.2	26.2	--	--	C	W	fhdm
LA05	2/17/99	2/23/99	5.1	5.1	16.3	82.7	B	W	m
LA05	2/23/99	3/2/99	8.4	8.4	34.6	290.2	B	W	m
LA05	3/2/99	3/9/99	24.1	24.1	8.8	212.4	B	W	dm

National Atmospheric Deposition Program/MDN

Site ID:LA05 Report Date: 11/19/01 3:26:04 PM

Site	Date On	Date Off	Subppt	Pptrec	HgConc	HgDep	QR	SampleType	Notes
LA05	3/9/99	3/16/99	76.2	76.2	11	840.3	B	W	dm
LA05	3/16/99	3/23/99	0	0	--	0	B	D	m
LA05	3/23/99	3/31/99	13.7	--	12.7	174.2	B	W	hdm
LA05	3/31/99	4/6/99	1.3	1.3	21.9	27.9	B	W	hdm
LA05	4/6/99	4/13/99	0	0	--	0	B	D	mz
LA05	4/13/99	4/20/99	0	0	--	0	B	T	hm
LA05	4/20/99	4/27/99	10.2	10.2	16	162.9	B	W	m
LA05	4/27/99	5/5/99	0	0	--	0	B	D	dm
LA05	5/5/99	5/11/99	30	30	16.8	502.9	B	W	dm
LA05	5/11/99	5/18/99	8.4	8.4	22.4	187.5	B	W	hdm
LA05	5/18/99	5/25/99	0	--	--	0	B	D	dm
LA05	5/25/99	6/1/99	62.2	62.2	13.9	865.4	B	W	hm
LA05	6/1/99	6/8/99	30.5	30.5	10.4	317.5	B	W	m
LA05	6/8/99	6/15/99	102.9	102.9	15.7	1615.2	B	W	dm
LA05	6/15/99	6/23/99	16.5	16.5	23.5	387.4	B	W	hdmz
LA05	6/23/99	6/29/99	127	127	9.1	1154.2	B	W	dm
LA05	6/29/99	7/6/99	8	8	23.3	186.3	B	W	hm
LA05	7/6/99	7/13/99	74.3	74.3	21.8	1622.5	B	W	dm
LA05	7/13/99	7/20/99	23.2	23.2	17.2	400.2	B	W	dm
LA05	7/20/99	7/27/99	10.7	10.7	--	--	C	W	fdm
LA05	8/13/99	8/17/99	0	0	--	0	B	D	sm
LA05	8/17/99	8/24/99	0	0	--	0	B	D	dm

National Atmospheric Deposition Program/MDN

Site ID:LA05 Report Date: 11/19/01 3:26:04 PM

Site	Date On	Date Off	Subppt	Pptrec	HgConc	HgDep	QR	SampleType	Notes
LA05	8/24/99	8/31/99	24.1	24.1	20.2	487.7	B	W	m
LA05	8/31/99	9/7/99	26.7	26.7	8.3	221.9	B	W	dm
LA05	9/7/99	9/14/99	10.2	10.2	44.6	453	B	W	m
LA05	9/14/99	9/21/99	0	0	--	0	B	T	dm
LA05	9/21/99	9/28/99	2	2	22.2	43.7	B	W	dm
LA05	9/28/99	10/5/99	13.1	13.1	11	144.3	B	W	dm
LA05	10/5/99	10/12/99	18.5	18.5	13.1	243.1	B	W	m
LA05	10/12/99	10/19/99	0	0	--	0	B	T	m
LA05	10/19/99	10/26/99	1.3	1.3	17.8	22.6	B	W	m
LA05	10/26/99	11/2/99	15.2	15.2	21.2	323.3	B	W	dm
LA05	11/2/99	11/8/99	0	0	--	0	B	D	m
LA05	11/9/99	11/16/99	0	0	--	0	B	D	m
LA05	11/16/99	11/23/99	0.5	--	44.6	22.2	B	T	idm
LA05	11/23/99	11/30/99	22.9	22.9	5.8	131.7	B	W	dm
LA05	11/30/99	12/7/99	24.1	24.1	5.6	134.9	B	W	dm
LA05	12/7/99	12/14/99	8.8	--	15.3	134.9	B	W	dm
LA05	12/14/99	12/21/99	67.1	67.1	7	472	B	W	dm
LA05	12/21/99	12/28/99	0	0	--	0	B	D	m
LA05	12/28/99	1/4/00	5.7	5.7	9.6	54.4	B	W	dm
LA05	1/4/00	1/11/00	0.6	0.6	43.8	27.8	B	T	dhmi
LA05	1/11/00	1/18/00	0	0	--	0	B	D	m
LA05	1/18/00	1/25/00	9.9	9.9	8.9	88.3	B	W	dm

National Atmospheric Deposition Program/MDN

Site ID:LA05 Report Date: 11/19/01 3:26:04 PM

Site	Date On	Date Off	Subppt	Pptrec	HgConc	HgDep	QR	SampleType	Notes
LA05	1/25/00	2/1/00	33.4	33.4	6.8	226.4	B	W	dm
LA05	2/1/00	2/8/00	7.1	7.1	21.6	153.5	B	W	dm
LA05	2/8/00	2/15/00	0	0	--	0	B	T	dm
LA05	2/15/00	2/22/00	2.1	--	12.6	26.9	B	W	dm
LA05	2/22/00	2/29/00	10.2	--	6.7	68.2	B	W	dm
LA05	2/29/00	3/9/00	0	0	--	0	B	D	edm
LA05	3/9/00	3/14/00	0	0	--	0	B	T	sdhm
LA05	3/15/00	3/22/00	39.9	39.9	13.5	541.1	B	W	dm
LA05	3/22/00	3/28/00	8.9	8.9	28	248.9	B	W	dm
LA05	3/28/00	4/4/00	90.2	90.2	5.1	462	B	W	d
LA05	4/4/00	4/11/00	0	0	--	0	B	D	dm
LA05	4/11/00	4/18/00	46.4	46.4	3.9	179.3	B	W	dm
LA05	4/18/00	4/25/00	0.8	0.8	88.8	67.7	B	W	di
LA05	5/2/00	5/9/00	146.7	146.7	8.2	1206.9	B	W	d
LA05	5/9/00	5/16/00	5.7	5.7	21	120.3	A	W	
LA05	5/16/00	5/23/00	25.4	25.4	15.5	392.5	B	W	m
LA05	5/23/00	5/31/00	0	0	--	0	A	T	
LA05	5/31/00	6/6/00	36.2	36.2	16.1	583.8	B	W	d
LA05	6/6/00	6/13/00	4.1	4.1	26.8	109	A	W	
LA05	6/20/00	6/27/00	27.3	27.3	12.3	337.1	B	W	d
LA05	6/27/00	7/5/00	78.2	78.2	16.8	1311.8	B	W	dm
LA05	7/5/00	7/11/00	2.9	2.9	38.7	112.9	B	W	m

National Atmospheric Deposition Program/MDN

Site ID:LA05 Report Date: 11/19/01 3:26:04 PM

Site	Date On	Date Off	Subppt	Pptrec	HgConc	HgDep	QR	SampleType	Notes
LA05	7/11/00	7/18/00	0	0	--	0	A	T	
LA05	7/18/00	7/25/00	22.2	22.2	11.9	264.8	B	W	d
LA05	7/25/00	8/1/00	44.3	--	15.8	702.3	B	W	dm
LA05	8/1/00	8/8/00	0	0	--	0	B	T	h
LA05	8/8/00	8/15/00	0.6	0.6	63.3	40.2	B	T	i
LA05	8/15/00	8/22/00	0	0	--	0	A	T	
LA05	8/22/00	8/29/00	3.6	3.6	32	114	B	W	d
LA05	8/29/00	9/5/00	4.2	4.2	90.4	379.1	B	W	d
LA05	9/5/00	9/12/00	6	6	11.7	69.6	B	W	d
LA05	9/12/00	9/19/00	7.4	--	31.6	232.8	B	W	hdm
LA05	9/19/00	9/26/00	2.2	2.2	15.5	33.6	A	W	
LA05	9/26/00	10/3/00	0	0	--	0	B	T	hn
LA05	10/3/00	10/10/00	35.9	35.9	11.4	407.4	B	W	d
LA05	10/10/00	10/17/00	0	0	--	0	A	T	
LA05	10/17/00	10/24/00	0	--	--	0	B	T	m
LA05	10/24/00	10/31/00	16.7	16.7	3.4	57.5	B	W	h
LA05	10/31/00	11/8/00	96.2	96.2	4	385.1	B	W	ed
LA05	11/8/00	11/13/00	35.8	35.8	6.9	246.7	B	W	sh
LA05	11/13/00	11/20/00	136.7	136.7	5.3	723.2	B	W	d
LA05	11/20/00	11/28/00	36.8	36.8	4.9	180.1	B	W	d
LA05	11/28/00	12/5/00	2.5	2.5	7.4	18.8	B	W	d
LA05	12/5/00	12/13/00	34	34	5.6	189.6	B	W	dh

National Atmospheric Deposition Program/MDN

Site ID:LA05 Report Date: 11/19/01 3:26:04 PM

Site	Date On	Date Off	Subppt	Pptrec	HgConc	HgDep	QR	SampleType	Notes
LA05	12/13/00	12/19/00	6.6	6.6	15.3	100.7	B	W	d
LA05	12/19/00	12/27/00	5	5	7	34.8	B	W	d

APPENDIX C

Summary of Precipitation Data from Two Coastal Weather Stations

Precipitation data for 1999 through 2000 (Hydrosphere, 2000)

	Precipitation - Monthly Average (centimeters)												Total
Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(m/yr)
Hackberry 99	8.5	3.9	9.3	0.9	14.2	22.3	18.4	0.5	11.2	3.8	1.3	14.6	1.09
Hackberry 00	3.9	3.0	6.0	6.4	17.9	15.5	9.6	10.6	7.3	8.7	39.6	6.1	1.35
Rockefeller 99	5.8	5.5	5.0	2.5	18.2	18.9	10.6	11.2	11.7	5.5	2.1	14.6	1.11
Rockefeller 00	3.6	2.2	5.4	2.4	19.6	2.8	7.8	8.0	5.2	0.3	31.0	6.9	0.95
Average	5.4	3.7	6.4	3.0	17.5	14.9	11.6	7.6	8.8	4.6	18.5	10.5	1.12

	Precipitation - Monthly Average (inches)												Total
Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(in/yr)
Hackberry 99	3.3	1.5	3.7	0.3	5.6	8.8	7.2	0.2	4.4	1.5	0.5	5.8	42.76
Hackberry 00	1.5	1.2	2.4	2.5	7.0	6.1	3.8	4.2	2.9	3.4	15.6	2.4	52.98
Rockefeller 99	2.3	2.2	2.0	1.0	7.2	7.4	4.2	4.4	4.6	2.2	0.8	5.7	43.89
Rockefeller 00	1.4	0.9	2.1	0.9	7.7	1.1	3.1	3.2	2.1	0.1	12.2	2.7	37.47
Average	2.1	1.4	2.5	1.2	6.9	5.9	4.6	3.0	3.5	1.8	7.3	4.2	44.3

APPENDIX D

MACT Mercury Emissions Data for Airshed

State	County	Urban / Rural	MACT Category	Number of Point Sources	Total Emissions	Point Source Emissions	Non-Point Source Emissions
LA	Calcasieu Parish	Urban	0105 - Stationary Reciprocal Internal Combustion Engines	0	0.019	0.000	0.019
LA	Cameron Parish	Rural	0105 - Stationary Reciprocal Internal Combustion Engines	0	0.010	0.000	0.010
LA	Vermilion Parish	Rural	0105 - Stationary Reciprocal Internal Combustion Engines	0	0.321	0.000	0.321
TX	Hardin	Urban	0105 - Stationary Reciprocal Internal Combustion Engines	0	0.002	0.000	0.002
TX	Jasper	Rural	0105 - Stationary Reciprocal Internal Combustion Engines	0	0.001	0.000	0.001
TX	Jefferson	Urban	0105 - Stationary Reciprocal Internal Combustion Engines	0	0.013	0.000	0.013
TX	Orange	Urban	0105 - Stationary Reciprocal Internal Combustion Engines	0	0.002	0.000	0.002
LA	Calcasieu Parish	Urban	0107 - Industrial/Commercial/ Institutional Boilers & Process Heaters	0	1.340	0.000	1.340
LA	Cameron Parish	Rural	0107 - Industrial/Commercial/ Institutional Boilers & Process Heaters	0	0.031	0.000	0.031
LA	Jefferson Davis Parish	Urban	0107 - Industrial/Commercial/ Institutional Boilers & Process Heaters	0	0.108	0.000	0.108
LA	Vermilion Parish	Rural	0107 - Industrial/Commercial/ Institutional Boilers & Process Heaters	0	0.200	0.000	0.200
TX	Hardin	Urban	0107 - Industrial/Commercial/ Institutional Boilers & Process Heaters	0	0.164	0.000	0.164
TX	Jasper	Rural	0107 - Industrial/Commercial/ Institutional Boilers & Process Heaters	4	4.200	3.660	0.540
TX	Jefferson	Urban	0107 - Industrial/Commercial/ Institutional Boilers & Process Heaters	0	2.140	0.000	2.140
TX	Newton	Rural	0107 - Industrial/Commercial/ Institutional Boilers & Process Heaters	1	0.364	0.032	0.332
TX	Orange	Urban	0107 - Industrial/Commercial/ Institutional Boilers & Process Heaters	2	2.220	1.750	0.469
TX	Orange	Urban	0410 - Portland Cement Manufacturing	1	0.141	0.141	0.000
TX	Jefferson	Urban	0502 - Petroleum Refineries - Catalytic Cracking, Catalytic Reforming, & Sulfur Plant Units	4	327	327	0.000
LA	Calcasieu Parish	Urban	0801 - Hazardous Waste Incineration	1	0.380	0.380	0.000
TX	Jefferson	Urban	0801 - Hazardous Waste Incineration	1	307	26.9	280
TX	Orange	Urban	0801 - Hazardous Waste Incineration	0	3.900	0.000	3.900
LA	Calcasieu Parish	Urban	0802 - Municipal Landfills	0	0.007	0.000	0.007
LA	Jefferson Davis Parish	Urban	0802 - Municipal Landfills	0	0.089	0.000	0.089
LA	Vermilion Parish	Rural	0802 - Municipal Landfills	0	0.020	0.000	0.020
TX	Hardin	Urban	0802 - Municipal Landfills	0	0.005	0.000	0.005
TX	Jefferson	Urban	0802 - Municipal Landfills	0	0.211	0.000	0.211
TX	Newton	Rural	0802 - Municipal Landfills	0	0.044	0.000	0.044
LA	Calcasieu Parish	Urban	1403 - Chlorine Production	1	1280	1280	0.000
TX	Hardin	Urban	1626 - Pulp And Paper Production	1	51.1	51.1	0.000
TX	Orange	Urban	1626 - Pulp And Paper Production	1	21.7	21.7	0.000
TX	Jasper	Rural	1626-2 - Pulp & Paper Production - Combustion (Kraft, Soda, Sulfite, & Semi-Chemical)	1	12.2	12.2	0.000
LA	Calcasieu Parish	Urban	1640 - Miscellaneous Organic Chemical Processes	0	0.012	0.000	0.012
LA	Jefferson Davis Parish	Urban	1640 - Miscellaneous Organic Chemical Processes	0	0.000	0.000	0.000
LA	Vermilion Parish	Rural	1640 - Miscellaneous Organic Chemical Processes	0	0.000	0.000	0.000
TX	Jasper	Rural	1640 - Miscellaneous Organic Chemical Processes	0	0.000	0.000	0.000
TX	Jefferson	Urban	1640 - Miscellaneous Organic Chemical Processes	0	0.015	0.000	0.015
TX	Orange	Urban	1640 - Miscellaneous Organic Chemical Processes	0	0.011	0.000	0.011
LA	Calcasieu Parish	Urban	1801 - Medical Waste Incinerators	0	48.6	0.000	48.6
LA	Jefferson Davis Parish	Urban	1801 - Medical Waste Incinerators	0	7.890	0.000	7.890
LA	Vermilion Parish	Rural	1801 - Medical Waste Incinerators	0	4.110	0.000	4.110
TX	Hardin	Urban	1801 - Medical Waste Incinerators	0	5.070	0.000	5.070
TX	Jasper	Rural	1801 - Medical Waste Incinerators	0	4.930	0.000	4.930
TX	Jefferson	Urban	1801 - Medical Waste Incinerators	0	110	0.000	110
TX	Orange	Urban	1801 - Medical Waste Incinerators	0	11.0	0.000	11.0
LA	Calcasieu Parish	Urban	1807-2 - Other Solid Waste Incineration - Crematories	0	1.080	0.000	1.080
LA	Cameron Parish	Rural	1807-2 - Other Solid Waste Incineration - Crematories	0	0.053	0.000	0.053
LA	Jefferson Davis Parish	Urban	1807-2 - Other Solid Waste Incineration - Crematories	0	0.193	0.000	0.193
LA	Vermilion Parish	Rural	1807-2 - Other Solid Waste Incineration - Crematories	0	0.311	0.000	0.311
TX	Hardin	Urban	1807-2 - Other Solid Waste Incineration - Crematories	0	0.289	0.000	0.289
TX	Jasper	Rural	1807-2 - Other Solid Waste Incineration - Crematories	0	0.200	0.000	0.200
TX	Jefferson	Urban	1807-2 - Other Solid Waste Incineration - Crematories	0	1.480	0.000	1.480
TX	Newton	Rural	1807-2 - Other Solid Waste Incineration - Crematories	0	0.087	0.000	0.087
TX	Orange	Urban	1807-2 - Other Solid Waste Incineration - Crematories	0	0.513	0.000	0.513
LA	Calcasieu Parish	Urban	1808-1 - Utility Boilers: Coal	1	370	370	0.000
TX	Orange	Urban	1808-2 - Utility Boilers: Natural Gas	1	0.000	0.000	0.000
LA	Calcasieu Parish	Urban	1808-3 - Utility Boilers: Oil	1	0.283	0.283	0.000

APPENDIX E

NPDES Point Source Dischargers in the Calcasieu River Basin

POINT SOURCE DISCHARGES IN CALCASIEU RIVER BASIN
(excluding coastal bays and Gulf of Mexico to State three-mile limit)

SUBSEGMENT	***SEGMENT / RECEIVING WATER***	***NPDES No.***	***FACILITY***
30103	30103/ Calcasieu River	LA0000493	Arizona Chemical
30103	30103/ Calcasieu River	LA0004901	Boise Cascade Corp.
30103	30103/Kinder Ditch	LA0020605	Town of Kinder
30103	30103/ Calcasieu River	LA0106127	Roy O. Miller Lumber Co., Inc.
30201	30201/Old Town Road	LA0049816	Central Crude Inc.
30201	30201/ Calcasieu River	LA0054399	American Int. Refining
30201	30201 / drainage ditch; to Moss Bluff Bay	LA0105376	Texaco Huber One-Stop
30201	30201 / marsh; to Calcasieu River	LA0108227	Moss Bluff Shopping
30201	30201 / Berry Bay; to Calcasieu River	LA0111490	Mcmanus Construction
30301	30301/Youngs Bayou	LA0001333	W.R. Grace & Co., Inc.
30301	30301/ Calcasieu River	LA0003689	Montel USA
30301	30301/Bayou D'Inde	LA0003824	Firestone Synthetic Rubber & Latex Co.
30301	30301/ Calcasieu River	LA0036340	City of Lake Charles
30301	30301/Little Bayou d'Inde	LA0053708	Air Liquide America Corp.
30301	30301/ Calcasieu River	LA0054062	Conoco Inc.
30301	30301/ Calcasieu Ship Channel	LA0067083	City of Sulphur
30301	30301/ Calcasieu River	LA0080829	LA Pigment Co., L.P.
30301	30301/ Calcasieu River	LA0082511	Westlake Petrochemical Corp.
30301	30301/ **001, 002** Calcasieu River **003** Indian Marais	LA0103004	Westlake Polymers Corp
30301	30301 / Calcasieu River	LA0104469	Lake Charles Pipeline
30301	30301 / Calcasieu River	LA0105279	Air Liquide
30301	30301/Bayou D'Inde	LA0107182	Praxair Inc.
30302	30302/Bayou Verdine	LA0000809	Conoco Inc.
30302	30302/ Calcasieu River	LA0003026	Conoco Inc.
30302	30302/Bayou Verdine	LA0003336	Vista Chemical Co.
30302	30302/See flow column	LA0005347	Lyondell Chemical Worldwide, Inc.
30302	30302/ Contraband Bayou	LA0036358	City of Lake Charles
30302	30302/ Contraband Bayou	LA0036366	City of Lake Charles
30302	30302/Silica Pigments ditch & PPG Canal	LA0041025	Certaineed Products Corp.
30302	30302/PPG Canal & Bayou D'Inde	LA0047058	Tessenderlo Kerley Inc.

SUBSEGMENT	***SEGMENT / RECEIVING WATER***	***NPDES No.***	***FACILITY***
30302	30302/ Calcasieu River	LA0065196	Carboline Co.
30302	30302/ Bayou D'Inde	LA0069850	Equistar Chemical
30302	30302/Bayou Verdine	LA0070106	Jupiter Chemicals
30302	30302/Bayou D'Inde	LA0071382	Westlake Polymers Corp
30302	30302/ Calcasieu River	LA0087157	Westlake Styrene Corp.
30304	30304/PPG Canal & Bayou D'Inde	LA0051730	Air Liquide America Corp.
30304	30304/ Calcasieu River	LA0064131	Conoco Inc.
30304	30304 / Little Bayou d'Inde	LA0101869	Cetco
30304	30304 / Bayou d'Inde	LA0108596	Denmar Enterprises
30304	30304 / **001** ditch to Calcasieu River **002** ditch to Moss Lake	LA0112097	Equilon Pipeline
30304	30304 / local drainage; to Moss Lake	LA0112704	Calcasieu Power LLC
30305	30305		
30306	30306/ Bayou Verdine	LA0065161	Tetra Technologies
30306	30306 / Bayou Verdine	LA0108383	Southern Scrap Material Co.
30401	30401/ Calcasieu River	LA0003654	Omega Protein
30401	30401/ Calcasieu River	LA0006246	Steed's Fish Co.
30401	30401/ Calcasieu River	LA0039136	Cameron Parish Sewage Dis. #1
30401	30401/ Calcasieu Ship Channel	LA0054143	Dynergy Midstream Services
30401	30401/East Fork Calcasieu River	LA0054172	Amerada Hess Corp.
30401	30401/ East Fork Calcasieu River	LA0054712	Amerada Hess Corp.
30401	30401/Devil's Elbow Industrial Canal; to Calcasieu River	LA0055522	Trunkline LNG Co.
30401	30401 / ditch; to Calcasieu Ship Channel	LA0102725	Cameron Parish Sewage Dis. #2
30401	30401 / Calcasieu Pass & Calcasieu Ship Channel	LA0105295	L&L Oil & Gas LLC
30401	30401	LA0107115	Halliburton Energy Service, Inc.
30401	30401/ Calcasieu Pass & Ship Channel	LA0107115	Halliburton Energy Service, Inc.
30402	30402		
30702	30702/English Bayou	LA0043605	Town of Iowa
30702	30702/Kinner Gully to English Bayou	LA0073253	Calcasieu Parish Waterworks
30702	30702/Moss Lake	LA0073261	Calcasieu Parish Waterworks

SUBSEGMENT	SEGMENT / RECEIVING WATER	NPDES No.	FACILITY
30702	30702 / effluent ditch; to English Bayou; to Calcasieu River	LA0074357	Calcasieu Parish Sewer District No. 11
30702	30702 / Antoine Gully; to English Bayou	LA0081647	Otis Engineering
30702	30702/ Kayouche Coulee	LA0101516	Coca Cola Bottling Co.
30702	30702/English Bayou	LA0102105	Jolly's Calcasieu Packing Co.
30702	30702/English Bayou	LA0104302	Huber Oil of LA, Inc.
30702	30702 / Farmer's Canal; to English Bayou	LA0105406	Buckner Rental Services Inc.
30702	30702/ Kayouche Coulee	LA0105686	Calcasieu Parish Police Jury
30702	30702 / drainage ditch; to English Bayou	LA0106674	National Resources AKA Lake Charles NRG
30801	30801/Houston River	LA0005843	Entergy Gulf States, Inc.
30801	30801/ Calcasieu River	LA0007242	Kansas City Southern Railway
30801	30801/West Fork Calcasieu River	LA0058882	Cecos International Inc.
30901	30901/Bayou d'Inde	LA0000761	PPG Industries
30901	30901/See flow column	LA0005941	Citgo Petroleum Corp.
30901	30901 / Bayou D'Inde	LA0064173	Oil Masters, Inc.
30901	30901/Maple Fork Creek	LA0104582	Aggreko
30901	30901/Maple Fork Creek	LA0105066	Head & Engquist Equipment
30901	30901/Bayou D'Inde	LA0105155	WH Holdings Inc.
30901	30901/Little Bayou D'Inde	LA0105660	Speedway Superamerica

APPENDIX F

Total Mercury Concentrations and Flow Data from PCS for LA0080829 and LA0058882

LA0080829 outfall 001 DMR data

Date	Max Q MGD	Avg Q MGD	Max Hg mg/L
Dec-00	0.63708	0.50865	< 0.0009
Nov-00	0.69031	0.61209	< 0.0002
Oct-00	0.67106	0.56633	< 0.0002
Sep-00	0.6662	0.53601	< 0.0002
Aug-00	0.70992	0.59289	< 0.0002
Jul-00	0.7171	0.61506	< 0.0002
Jun-00	0.7006	0.597	< 0.0002
May-00	0.71003	0.64206	< 0.0002
Apr-00	0.70757	0.54867	< 0.0002
Mar-00	0.6732	0.55336	< 0.0002
Feb-00	0.57465	0.52446	< 0.0002
Jan-00	0.66135	0.51775	0.0012
Dec-99	0.63824	0.53239	< 0.0005
Nov-99	0.66829	0.52778	< 0.0005
Oct-99	0.68431	0.53513	0.0022
Sep-99	0.84304	0.54889	0.004
Aug-99	0.67035	0.55096	< 0.0005
Jul-99	0.65852	0.53655	< 0.0005
Jun-99	0.63191	0.50934	< 0.0005
May-99	0.66623	0.52764	< 0.0005
Apr-99	0.63329	0.4106	< 0.0005
Mar-99	0.5751	0.45221	< 0.0008
Feb-99	0.63368	0.49412	< 0.0008
Jan-99	0.7365	0.54799	< 0.0049
Maximum	0.84304		0.0049
Average			0.000846
Minimum			0.0002
Upper Boundary Load (g/yr)			5,707
Mid Range Load (g/yr)			985
Lower Boundary Load (g/yr)			233

LA0080829 outfall 004 DMR data

Date	Max Q MGD	Avg Q MGD	Max Hg mg/L
Dec-00	0.77299	0.64821	< 0.0002
Nov-00	1.54836	0.8401	< 0.0002
Oct-00	0.66898	0.66898	< 0.0002
Sep-00	0.75662	0.59453	< 0.0002
Aug-00	0.84137	0.55334	< 0.0002
Jul-00	0.63281	0.60509	< 0.0002
Jun-00	1.73781	0.82707	< 0.0002
May-00	1.01878	0.67672	< 0.0002
Apr-00	0.89	0.518	< 0.0002
Mar-00	0.77114	0.77114	< 0.0002
Feb-00	0	0	
Jan-00	1.09877	1.09877	< 0.0002
Dec-99	1.15025	0.90209	< 0.0005
Nov-99	0.8873	0.8873	< 0.0005
Oct-99	0.61723	0.61723	< 0.0005
Sep-99	0.58661	0.54992	< 0.0005
Aug-99	0.69986	0.69986	< 0.0005
Jul-99	1.36	1.18667	< 0.0005
Jun-99	1.2	1.0222	< 0.0005
May-99	1.4	1.4	< 0.0005
Apr-99	0	0	
Mar-99	0.789	0.7379	< 0.0008
Feb-99	1	1	< 0.0008
Jan-99	1.3	1.09	< 0.0008
Maximum	1.73781		0.0008
Average			0.000391
Minimum			0.0002
Upper Boundary Load (g/yr)			1,921
Mid Range Load (g/yr)			939
Lower Boundary Load (g/yr)			480

LA0058882 outfall 001 DMR data

Date	Max Hg mg/L	
Dec-00		
Nov-00	< .0002	
Oct-00		
Sep-00	<0.0002	
Aug-00		
Jul-00		
Jun-00		
May-00		
Apr-00		
Mar-00		
Feb-00		
Jan-00	< 0.2	
Dec-99	<0.0002	
Nov-99		
Oct-99		
Sep-99	<0.0002	
Aug-99	<0.0002	
Jul-99	<0.0002	
Jun-99	0.0003	
May-99	<0.0002	
Apr-99		
Mar-99	<0.0002	
Feb-99		
Jan-99	<0.0002	
Maximum	0.0003	(exclude 0.2)
Average	0.00021	(exclude 0.2)
Minimum	0.0002	
Design Q	0.12	
Upper Boundary Load (g/yr)	50	
Mid Range Load (g/yr)	34.8	
Lower Boundary Load (g/yr)	33.2	

LA0058882 outfall 002 DMR data

Date	Max Hg mg/L
Dec-00	
Nov-00	
Oct-00	
Sep-00	
Aug-00	
Jul-00	
Jun-00	
May-00	
Apr-00	
Mar-00	
Feb-00	
Jan-00	
Dec-99	
Nov-99	
Oct-99	
Sep-99	<0.0002
Aug-99	<0.0002
Jul-99	<0.0002
Jun-99	0.0005
May-99	<0.0002
Apr-99	
Mar-99	<0.0002
Feb-99	
Jan-99	<0.0002
Maximum	0.0005
Average	0.000243
Minimum	0.0002
Design Q	0.18
Upper Boundary Load (g/yr)	124
Mid Range Load (g/yr)	60.4
Lower Boundary Load (g/yr)	49.7

LA0058882 outfall 002 DMR data

Date	Max Hg mg/L
Dec-00	
Nov-00	
Oct-00	
Sep-00	
Aug-00	
Jul-00	
Jun-00	
May-00	
Apr-00	
Mar-00	
Feb-00	
Jan-00	
Dec-99	
Nov-99	
Oct-99	
Sep-99	<0.0002
Aug-99	<0.0002
Jul-99	<0.0002
Jun-99	<0.0002
May-99	<0.0002
Apr-99	
Mar-99	<0.0002
Feb-99	
Jan-99	<0.0002
Maximum	0.0002
Average	0.0002
Minimum	0.0002
Design Q	0.014
Upper Boundary Load (g/yr)	3.9
Mid Range Load (g/yr)	3.87
Lower Boundary Load (g/yr)	3.87

Notes: When concentration reported at less than a value, use that value in calculations.

APPENDIX G

Modeled 1998 Flow for Calcasieu River at Saltwater Barrier Provided by Dr. Ehab Meshele of the University of Louisiana at Lafayette

Flows for Calcasieu River at the salt water barrier - provided by Dr. Ehab Mesehle of UALL

Year	Month	Day	Flow, cms
1998	1	1	291
1998	1	2	282
1998	1	3	260
1998	1	4	234
1998	1	5	252
1998	1	6	280
1998	1	7	463
1998	1	8	688
1998	1	9	802
1998	1	10	1058
1998	1	11	1131
1998	1	12	943
1998	1	13	1287
1998	1	14	2136
1998	1	15	2183
1998	1	16	1464
1998	1	17	1052
1998	1	18	755
1998	1	19	500
1998	1	20	327
1998	1	21	268
1998	1	22	411
1998	1	23	620
1998	1	24	656
1998	1	25	578
1998	1	26	521
1998	1	27	444
1998	1	28	289
1998	1	29	222
1998	1	30	204
1998	1	31	204
1998	2	1	209
1998	2	2	206
1998	2	3	184
1998	2	4	141
1998	2	5	103
1998	2	6	84
1998	2	7	73
1998	2	8	67
1998	2	9	64
1998	2	10	62
1998	2	11	99
1998	2	12	187
1998	2	13	212
1998	2	14	216
1998	2	15	185
1998	2	16	170
1998	2	17	238
1998	2	18	265

Year	Month	Day	Flow, cms
1998	2	19	271
1998	2	20	253
1998	2	21	221
1998	2	22	218
1998	2	23	288
1998	2	24	323
1998	2	25	323
1998	2	26	301
1998	2	27	319
1998	2	28	349
1998	3	1	328
1998	3	2	274
1998	3	3	218
1998	3	4	192
1998	3	5	176
1998	3	6	174
1998	3	7	216
1998	3	8	306
1998	3	9	343
1998	3	10	337
1998	3	11	313
1998	3	12	295
1998	3	13	210
1998	3	14	180
1998	3	15	167
1998	3	16	190
1998	3	17	341
1998	3	18	416
1998	3	19	444
1998	3	20	426
1998	3	21	387
1998	3	22	295
1998	3	23	206
1998	3	24	184
1998	3	25	185
1998	3	26	203
1998	3	27	208
1998	3	28	188
1998	3	29	145
1998	3	30	101
1998	3	31	77
1998	4	1	65
1998	4	2	58
1998	4	3	57
1998	4	4	56
1998	4	5	51
1998	4	6	47
1998	4	7	43
1998	4	8	41
1998	4	9	39
1998	4	10	38

Year	Month	Day	Flow, cms
1998	4	11	36
1998	4	12	34
1998	4	13	32
1998	4	14	31
1998	4	15	30
1998	4	16	29
1998	4	17	29
1998	4	18	32
1998	4	19	37
1998	4	20	36
1998	4	21	55
1998	4	22	69
1998	4	23	64
1998	4	24	61
1998	4	25	61
1998	4	26	60
1998	4	27	55
1998	4	28	71
1998	4	29	61
1998	4	30	64
1998	5	1	63
1998	5	2	62
1998	5	3	56
1998	5	4	50
1998	5	5	48
1998	5	6	47
1998	5	7	45
1998	5	8	42
1998	5	9	38
1998	5	10	35
1998	5	11	33
1998	5	12	31
1998	5	13	29
1998	5	14	28
1998	5	15	27
1998	5	16	27
1998	5	17	27
1998	5	18	26
1998	5	19	25
1998	5	20	24
1998	5	21	24
1998	5	22	23
1998	5	23	23
1998	5	24	23
1998	5	25	22
1998	5	26	22
1998	5	27	21
1998	5	28	20
1998	5	29	20
1998	5	30	20
1998	5	31	20

Year	Month	Day	Flow, cms
1998	6	1	19
1998	6	2	18
1998	6	3	18
1998	6	4	18
1998	6	5	17
1998	6	6	18
1998	6	7	20
1998	6	8	19
1998	6	9	19
1998	6	10	20
1998	6	11	19
1998	6	12	18
1998	6	13	17
1998	6	14	17
1998	6	15	16
1998	6	16	16
1998	6	17	15
1998	6	18	15
1998	6	19	14
1998	6	20	14
1998	6	21	14
1998	6	22	14
1998	6	23	13
1998	6	24	13
1998	6	25	13
1998	6	26	14
1998	6	27	17
1998	6	28	18
1998	6	29	17
1998	6	30	17
1998	7	1	17
1998	7	2	17
1998	7	3	17
1998	7	4	17
1998	7	5	17
1998	7	6	16
1998	7	7	16
1998	7	8	15
1998	7	9	14
1998	7	10	14
1998	7	11	13
1998	7	12	13
1998	7	13	12
1998	7	14	14
1998	7	15	15
1998	7	16	17
1998	7	17	23
1998	7	18	22
1998	7	19	19
1998	7	20	17
1998	7	21	15

Year	Month	Day	Flow, cms
1998	7	22	16
1998	7	23	18
1998	7	24	16
1998	7	25	15
1998	7	26	15
1998	7	27	14
1998	7	28	14
1998	7	29	13
1998	7	30	13
1998	7	31	13
1998	8	1	12
1998	8	2	12
1998	8	3	13
1998	8	4	12
1998	8	5	12
1998	8	6	12
1998	8	7	12
1998	8	8	14
1998	8	9	24
1998	8	10	32
1998	8	11	31
1998	8	12	26
1998	8	13	22
1998	8	14	25
1998	8	15	21
1998	8	16	22
1998	8	17	35
1998	8	18	27
1998	8	19	26
1998	8	20	23
1998	8	21	22
1998	8	22	22
1998	8	23	21
1998	8	24	22
1998	8	25	25
1998	8	26	22
1998	8	27	19
1998	8	28	17
1998	8	29	16
1998	8	30	15
1998	8	31	17
1998	9	1	15
1998	9	2	16
1998	9	3	15
1998	9	4	14
1998	9	5	14
1998	9	6	13
1998	9	7	12
1998	9	8	13
1998	9	9	12
1998	9	10	13

Year	Month	Day	Flow, cms
1998	9	11	52
1998	9	12	281
1998	9	13	519
1998	9	14	729
1998	9	15	917
1998	9	16	1084
1998	9	17	974
1998	9	18	782
1998	9	19	625
1998	9	20	450
1998	9	21	321
1998	9	22	288
1998	9	23	264
1998	9	24	236
1998	9	25	205
1998	9	26	175
1998	9	27	149
1998	9	28	117
1998	9	29	85
1998	9	30	68
1998	10	1	28
1998	10	2	24
1998	10	3	22
1998	10	4	23
1998	10	5	22
1998	10	6	24
1998	10	7	38
1998	10	8	44
1998	10	9	42
1998	10	10	35
1998	10	11	34
1998	10	12	37
1998	10	13	37
1998	10	14	33
1998	10	15	28
1998	10	16	24
1998	10	17	21
1998	10	18	18
1998	10	19	17
1998	10	20	16
1998	10	21	15
1998	10	22	14
1998	10	23	14
1998	10	24	13
1998	10	25	13
1998	10	26	12
1998	10	27	12
1998	10	28	12
1998	10	29	12
1998	10	30	12
1998	10	31	11

Year	Month	Day	Flow, cms
1998	11	1	11
1998	11	2	12
1998	11	3	12
1998	11	4	13
1998	11	5	13
1998	11	6	12
1998	11	7	11
1998	11	8	12
1998	11	9	12
1998	11	10	13
1998	11	11	13
1998	11	12	13
1998	11	13	12
1998	11	14	26
1998	11	15	81
1998	11	16	122
1998	11	17	146
1998	11	18	163
1998	11	19	346
1998	11	20	834
1998	11	21	862
1998	11	22	715
1998	11	23	553
1998	11	24	424
1998	11	25	328
1998	11	26	259
1998	11	27	202
1998	11	28	141
1998	11	29	95
1998	11	30	66
1998	12	1	51
1998	12	2	42
1998	12	3	37
1998	12	4	34
1998	12	5	31
1998	12	6	30
1998	12	7	28
1998	12	8	28
1998	12	9	29
1998	12	10	36
1998	12	11	94
1998	12	12	190
1998	12	13	241
1998	12	14	281
1998	12	15	347
1998	12	16	631
1998	12	17	1063
1998	12	18	1036
1998	12	19	792
1998	12	20	583
1998	12	21	435

Year	Month	Day	Flow, cms
1998	12	22	335
1998	12	23	265
1998	12	24	203
1998	12	25	152
1998	12	26	115
1998	12	27	94
1998	12	28	149
1998	12	29	244
1998	12	30	256
1998	12	31	209

Average Flow = 167.03

APPENDIX H

Response to Public Comments

April 29, 2002

Ms. Ellen Caldwell, Environmental Protection Specialist
Water Quality Protection Division
United States Environmental Protection Agency, Region 6
1445 Ross Avenue
Dallas, Texas 75202-2733

RE: Comments on Federal Register: March 29, 2002 (Volume 67, Number 61) [FRL-7165-6], Clean Water Act Section 303(d): Availability of Total Maximum Daily Loads (TMDLs) and Determinations that TMDLs are not needed for 20 waterbody/pollutant combinations in the Calcasieu and Ouachita river basins.

Dear Ms. Caldwell:

The Louisiana Department of Environmental Quality hereby submits comments on the 98 TMDLs and the calculations for these TMDLs prepared by EPA Region 6 for waters listed in the Calcasieu and Ouachita river basins, under section 303(d) of the Clean Water Act. Listed below are general comments. Refer to the Attachments for specific comments and discussion.

1. It is inappropriate to use non-regulatory "targets" (sediment guidelines or others) as end-points for TMDLs.

2. Incorrect flows were applied in some areas (e.g. harmonic mean was used rather than tidal flows).

3. EPA's use of non-clean technique metals data is inappropriate. Metals data from the Superfund project should not have been used at all since clean sampling and analysis techniques were not used. When EPA did use these data, they were often not applied correctly. For example, Louisiana instream criteria are based on dissolved metals; yet EPA used both dissolved and total metals data to compare to the dissolved criteria. EPA’s use of applying total metals to dissolved metals criteria in order to determine exceedences is flawed.

4. LDEQ Ambient Network data should not have been used to justify TMDLs for the same reason as the Superfund data. The available LDEQ data were not collected and analyzed using clean techniques. LDEQ uses

these data as a screening tool to target more intensive sampling and analysis using clean techniques, not for justifying and developing TMDLs.

5. It is inappropriate to assume industries discharge a pollutant when it has not been included in their permit. EPA knows that when effluent limits are determined for each facility based on a number of factors, including the type of facility, types of waste-streams and effluent data submitted during the application process.

6. Monitoring schedules and locations for the different pollutants have been recommended for Louisiana throughout the document; Louisiana will continue its ambient and intensive monitoring programs according to established schedules and agreements.

7. LDEQ's comments concerning specific TMDLs will indicate that EPA has made numerous errors in listing dischargers in the TMDL.

8. The use of sediment data to assess for water quality use impairment and need for TMDLs has no precedent. Neither LDEQ nor EPA has promulgated sediment criteria. Therefore, the use of non- regulatory sediment guidelines and screening values, as Region 6 has done in this report, is not appropriate in assessing for water quality impairment or determining the need for TMDLs.

9. Many of these TMDLs are based on models using historical water quality data gathered at a single or small number of locations rather than survey data gathered at sites spaced throughout the waterbody. The hydraulic information used was generally an average value or estimated value, not taken at the same time as the water quality data. The calibrations are inadequate due to the lack of appropriate hydrologic data and the paucity of water quality data. The resulting TMDLs are invalid. LDEQ does not accept these TMDLs.

We look forward to hearing your response to these comments.

Sincerely,

Emelise S. Cormier
Environmental Scientist Senior
Technology Division

Enclosure(s)

c: Willie Lane
EPA
Region 6

LDEQ COMMENTS ON THE DRAFT TMDLS PUBLISHED BY EPA

LDEQ has reviewed the TMDLs published by EPA on March 29, 2002. One particularly troubling issue for LDEQ is the fact that numerous dischargers that should have been included in these TMDLs were not. This indicates a complete disregard for the discharger inventory LDEQ provided to EPA. At the least, the TMDLs should acknowledge all facilities present in the covered watershed(s) and present the decisions for including or not including them in the TMDL.

In the future, LDEQ requests that EPA provide hard copies of the TMDLs and Appendices for LDEQ review. Hard copies will insure that the complete official document is being reviewed and will eliminate the time required for LDEQ to put together the document from electronic files.

In general, LDEQ found these TMDLs to be unacceptable.

Federal Register Notice: Volume 67, Number 61, pages 15196 - 15198 (3/29/2002)

MERCURY

Ouachita River Mercury (Subsegment 080101)
Coastal Waters of Calcasieu River Basin TMDL for Mercury (Subsegment 031201)

General Comments on Mercury TMDLs:

1. It was assumed that a linear relationship exists between the mercury load to the subsegment and the king mackerel tissue mercury concentrations. The relationship between mercury load to a waterbody and the accumulation of mercury in the fish tissue is not thoroughly understood. A TMDL based on this relationship is disputable.

Response: EPA agrees that the relationship between concentrations of mercury in a waterbody and the accumulations of mercury in fish tissue can be complex and is not completely understood. However, in the interest of completing mercury TMDLs within court ordered schedules, some simplified assumption regarding this relationship had to be made. Assumption of linear relationship has precedence in previous mercury TMDLs based on fish tissue concentrations. This TMDL can be re-evaluated in the future taking into account a more realistic representation of the relationship between mercury in fish tissue and the environment as this interaction becomes better understood.

2. The calculations for the load allocations should be thoroughly explained. Sample calculations should be provided in the appendices.

Response: Explanations of the methods for calculating the load allocations have been added to the document.

TMDL Stream Specific Comments:
Coastal Waters of Calcasieu River Basin TMDL for Mercury (Subsegment 031201)

1. Section 4.4.2 Local and Global/Regional Atmospheric Deposition Sources; Paragraph 3; Sentences 5-7; Page4-7: The documentation showed that the total mercury emissions for Calcasieu Parish were 1,702 lb. This data was obtained from the National Toxics Inventory (NTI). LDEQ's Toxic Emissions Data Inventory Program stated the emissions for Calcasieu Parish were 1,222 lb. for 1999 and 1,281 for 1996. Mercury emissions from local sources were estimated with the higher NTI values. These values are not consistent with LDEQ's data.

Response: Additional text has been added to this paragraph explaining that the loads reported by TEDI and NIT are different because NTI includes loads from minor sources as well as major sources. NTI data were used because it was judged to be a more comprehensive accounting of mercury loading in the airshed.

2. Section 4.4.5 Current Mercury Load Summary; Page 4-10: Sentence three states that no point source contributions were included in the TMDL. This contradicts statements made in Section 4.4.4, Paragraph 2.

Response: Additional text has been added to this paragraph to clarify that while point source data were used to estimate a mercury load for the Calcasieu River, these point sources were not included in the TMDL load allocation as WLAs since they do not discharge directly to the subsegment. Load allocations for these point sources are expected to be addressed in mercury TMDLs of the Calcasieu River.